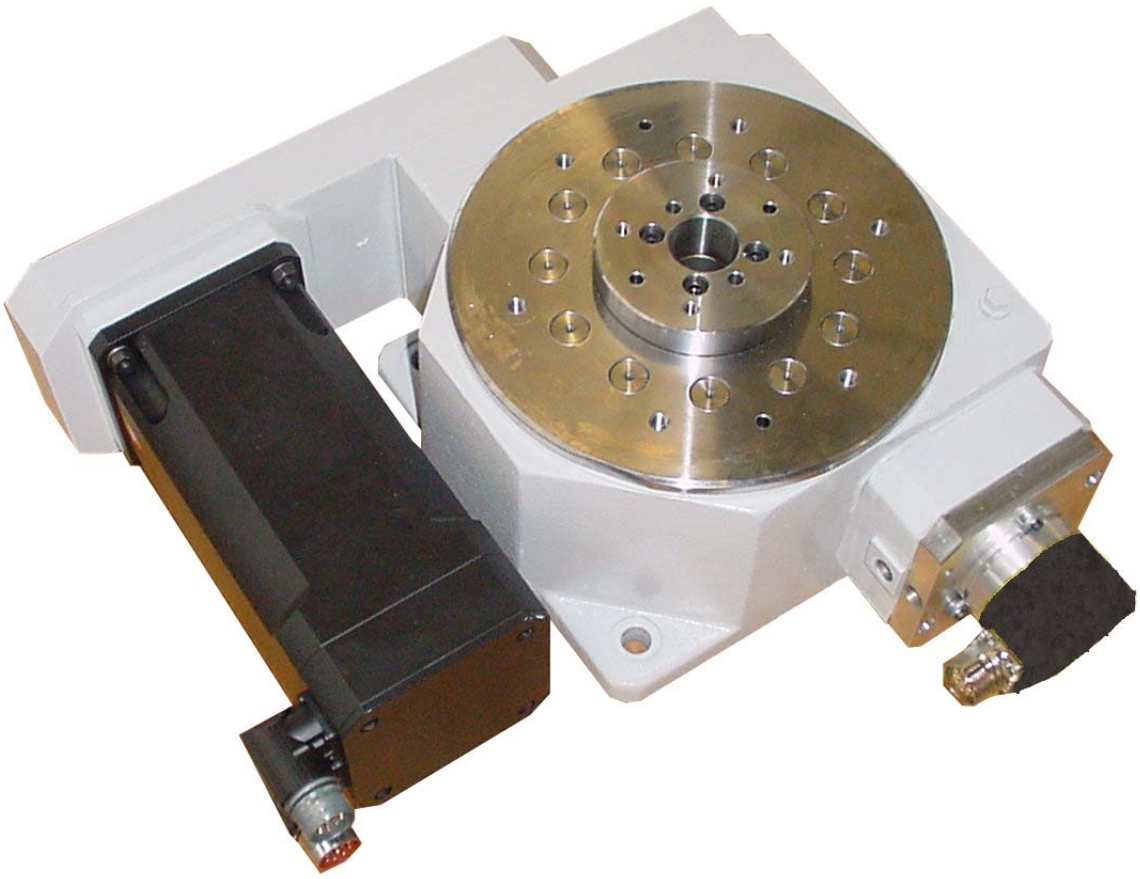
Numeric controlled indexing tables Series NCxxxTBx

(with B&R Controller & Absolute Encoder)

Operating Instructions



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1. Safety Regulations

1.1 Safety and application notes

The operating instructions should be read carefully before initial operation!

The initial operation of the indexing table may only take place once the total system and control, especially the safety system, comply with the Machine Guideline 98/37/EG!

Before adjustment or maintenance work the power supply to the motor has to be switched off and the motor has to be protected against re-start!

To protect the operators from crushing by the mechanical system during normal operation, appropriate protective devices such as protective grids, covers, light barriers or step sensors have to be installed!

Any work such as transport, storage, installation, initial operation and service of the control system and the mechanical system may only be performed by trained expert staff.
Trained expert staff consists of persons that have the appropriate qualifications and are familiar with performing the aforementioned work and the operation of the product.
The national accident prevention regulations have to be adhered to.
The safety guidelines, connection descriptions in the technical data and the documentation are to be read carefully before installation and commissioning must be observed.

Unauthorized removal of the required covers, inappropriate use and improper installation or operation can cause bodily injuring and / or severe damage to the systems.
The installation and cooling of the systems has to be performed according to these specifications. The control system (PLC and ACOPOS drive) has to be protected from improper usage. ACOPOS drive and PLC contain electrostatically sensitive components that can easily be damaged by improper handling. Electrical components may not be mechanically damaged or destroyed (possible health risk)!

WEISS systems comply with the currently valid VDE regulations. The VDE regulations also have to be taken into account when the systems are modified or un-installed.

Notes concerning correct installation with regard to electromagnetic compatibility (EMC), e.g. shielding, grounding and installation of cables, are included in this documentation. Adherence to the thresholds required by the EMC legislation is the responsibility of the manufacturer of the system.

Unauthorized changes and the use of spare parts and add-on devices that are not recommended by the manufacturer, may lead to injuries of persons and damage to the mechanics and control system.

Some components (motor, ACOPOS drive) may have hot surfaces during operation. The operating temperatures may be > 60 °C (> 140 °F). Skin contact leads to burns.

It has to be ensured that the casing is properly connected with the ground potential (PE-busbar) before the ACOPOS drives are switched on.
The ACOPOS drive are allowed to be operated directly on grounded, three-phase industrial mains (TN, TT systems).
Control and power connections may be live even if the motor is standing still. Never remove or plug the electrical connections of the system when they are live.

All pluggable connections should only be connected or disconnected when power is off!

Wait at least 5 minutes after the system has been switched off before touching live parts or disconnecting connections. All supply voltages connected to the system have to be safely separated from the power mains.

Appropriate usage
This system is intended for industrial and professional plants and complies with current standards and regulations. All information concerning technical data and the permitted conditions at the site of installation has to be adhered to at all times. This system is a component to be installed in machines. The initial operation (start of the appropriate use) in prohibited until it has been established that the machine complies with the EMC Guideline 89/336/EWG and that the final product complies with the Machine Guideline 98/37/EG.

Transport and storage
The systems have to be protected from inappropriate exposure (mechanical load, temperature, humidity, aggressive atmosphere) during transport and storage.

EMERGENCY-STOP:
The contact "Enable" at the ACOPOS drive (contact X1/9) is implemented as a "secure restart inhibit" to de-activate the system and prevent unexpected re-operation. This corresponds to Safety Category 3 according to EN 954-1. In addition to preventing unexpected re-operation according to EN 1037, this safety installation also provides the stop functions of the Categories 0 and 1 required by EN 60204-1.
This is described in a separate chapter in these operating instructions (Chapter 4.9). The instructions in the chapter must be adhered to.
A wiring diagram is also provided in this document.

2. Technical Data

2.1 General data

2.1.1 ACOPOS drive:

	NC150	NC220	NC320, NC500
Type :	ACOPOS: 8V1022.00-2	ACOPOS: 8V1045.00-2	ACOPOS: 8V1090.00-2
Permitted temperature ranges:	Storage: -25°C...+55°C (-13 °F … 131 °F) Operation: 0°C...+40°C (32 °F … 104 °F)		
Installation position:	vertical		
Air humidity:	5 to 95%, not condensing		
Mains input voltage:	3 x 400 VAC to 480VAC +-10%, 48Hz to 62Hz mains filter according to EN 61800-3-A11 second environment		
Installed load:	max. 3 kVA	max. 5 kVA	max. 10 kVA
Main Fuse:	10A time delay	16A time delay	16A time delay
Peak Current:	14 A_{eff}	24 A_{eff}	24 A_{eff}
Continuous Current:	2.2 A_{eff}	4.4 A_{eff}	8.8 A_{eff}
Starting current:	4 A	7 A	7 A
Switch-on interval:	> 10 sec		
Power loss at max. device power without brake resistor:	< 120 W	< 180 W	< 200 W
EMC:	According to EG Guideline 89/336/EWG Applied harmonised standards: EN 61800-3 (Noise resistance) EN 550011, Class B (Noise emission)		
Low-voltage guideline:	According to EG Guideline 73/23/EWG Applied harmonised standards: EN60204.1 / VDE113 EN50178 / VDE160		
Protection according to IEC 60529:	IP 20		
C-UL-US listed:	YES		
Dimensions:	Width: 70.5mm Height: 375mm Depth: 236mm		
Weight:	4.0 kg	4.1 kg	4.4 kg

2.1.2 Motor:

	NC150	NC220	NC320	NC500
Type:	8MSA3M.R0-I9	8MSA4M.R0V7	8MSA4X.R0-V7	8MSA5M.R0-V6
Permitted temperature ranges:	Storage: -20°C...+60°C (-4 °F … 140 °F) Operation: -15°C...+40°C (5 °F … 104 °F)			
Protection according to IEC 60529:	IP 64			
C-UL-US listed:	YES			
Rated speed:	6000 RPM	4500 RPM	4500 RPM	4500 RPM
Stall-/Peak torque:	1.0 / 5.2 Nm => limit to **4.8Nm**	4.1 / 21.2 Nm => limit to **7Nm**	7.5 / 38.0 Nm => limit to **12Nm**	7.5 / 38.0 Nm => limit to **18Nm**
Rated Power:	0.63kW	1.93kW	3.53kW	3.4kw
Weight:	2.6 kg	6.3 kg	11.0 kg	11.0 kg
Brake torque:	4.0 Nm	8.0 Nm	8.0 Nm	15.0Nm

2.1.3 Encoder:

Type:	HEIDENHAIN ROQ 425 EnDat
Resolution:	approx. 25 million increments at output shaft

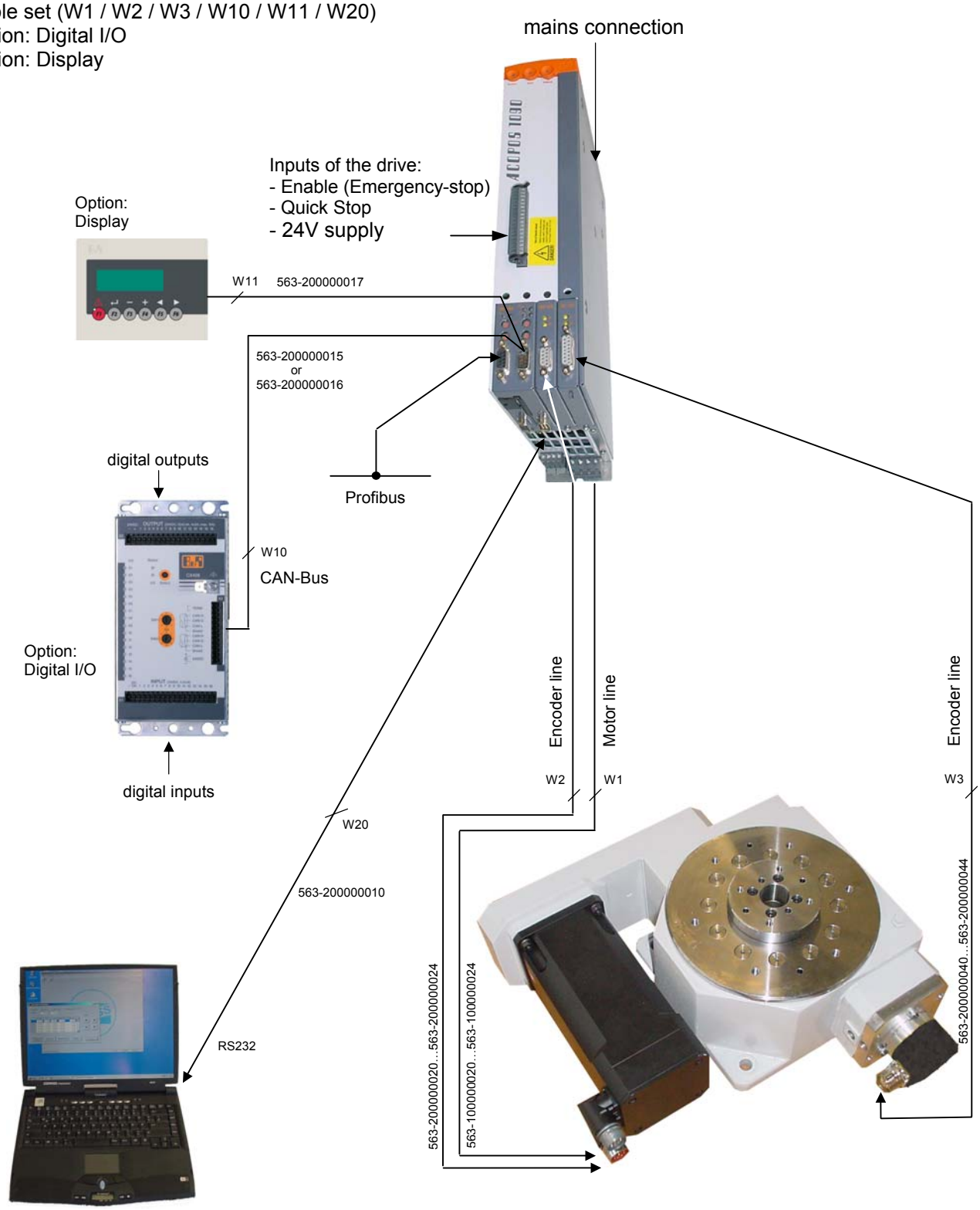
2.2 Electrical connection:

24 Volt control voltage	20...28V DC, residual ripple < 10 %	
Power input 24 Volt	ACOPOS drive, PLC, Display: 1.3A typical / 2.1A max. brake: 0.5A … 1.0A please use fuse: 6A time delay	
Digital inputs	Level	LOW (0V... +4 V) HIGH (+15V...+30 V)
	Input current	approx. 4 mA at 24 V
	Input filter	1ms
Digital outputs	Load capacity	max. 0.5 A per output
Profibus	Profibus DP, Slave, ≤12 Mbit, floating	

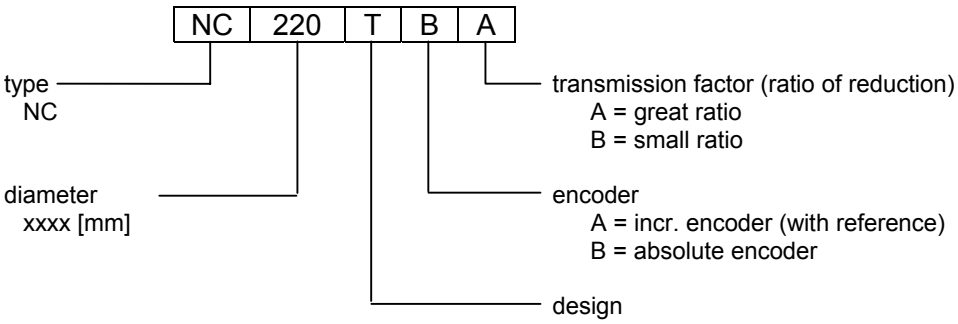
3. Structure

3.1 Overview

The system consists of the following modules:
- Mechanics
- ACOPOS drive 1022 / 1045 or 1090
- Cable set (W1 / W2 / W3 / W10 / W11 / W20)
- Option: Digital I/O
- Option: Display



3.2 Naming



3.3 ACOPOS drive

The motor manufacturer provides a suitable drive for the control of the motor. The drive has his own intelligence for the control of rotation, speed and position loop.
Three plug-in cards are inserted into the ACOPOS drive: controller (AC140) and encoder interface 1 & 2 (AC122 / AC120).
The ACOPOS drive communicates through the CAN Bus with separate digital I/O. The requirements for the CAN Bus cabling have to be adhered to (terminating resistors at both ends of the CAN Bus).
Newest technique for emergency stops (quick stop ramp and also a secure restart inhibit (category 3)) are integrated.

3.4 Controller

The controller (AC140) is a convenient interface between the customer interface and the ACOPOS drive. It provides the required movement commands at the correct time and converts the preselected position values of degree into motor increments.

The operation for standard tasks (indexing table with fixed graduation) is performed with a hand-held display. A Windows Program is available to use the full scope of the software. It is connected to the controller through a serial interface (RS-232). The RS-232 interface is also used for debugging and remote maintenance through a modem or for visualisation. An OPC server for connecting professional visualisation programs (WIN-CC, Wonderware, Intellution...) is also available. The following interfaces are supported in addition: DDE server, HTML server und Intouch Fast-DDE.

Digital I/Os and a Profibus interface (Profibus DP, Slave, ≤12Mbit) are available as customer interfaces. Other interfaces (CAN, RS232, RS485, Ethernet, etc.) are available on request.

The controller allows the following modes of operation:
- Jogging operation
- Teach zero position
- Move to fixed stations (graduation from 2...1500)
- Teach positions
- Move to position 1...127 (absolute or relative)
- 10 sequences with 40 commands each
- 8 freely programmable cams
- 8 trigger outputs

Slot PLC Type AC140:

The Slot PLC are mounted in the left slot of the ACOPOS drive (requires two slots). The module offers interchangeable application memory in the form of a Compact Flash card as well as a separate backup battery.

PLC	
Processor Clock	100MHz
SRAM	32kB
DRAM	8MB
Application Interface IF1	
Interface Type	RS232
Electrical Isolation	No
Design	9-pin DSUB plug
Max. Baud Rate	115,2 kBaud
Indications	X1 LED
Application Interface IF2	
Interface Type	CAN
Electrical Isolation	YES
Design	9-pin DSUB plug
Max. Baud Rate	500 kBit/s (up to 60m)
Indications	RX / TX LED's
Bus Termination Resistor	extern
Application Interface IF3	
Interface Type	Profibus DP
Electrical Isolation	YES
Design	9-pin DSUB socket
Controller	ASIC SPC3
RAM	1,5 kByte
Max. Baud Rate Bus Lengths up to 100m Bus Lengths up to 200m Bus Lengths up to 400m	 12 Mbit/s 1,5 Mbit/s 500 kBit/s
Indications	RX / TX LED's
Bus Termination Resistor	extern

Indications

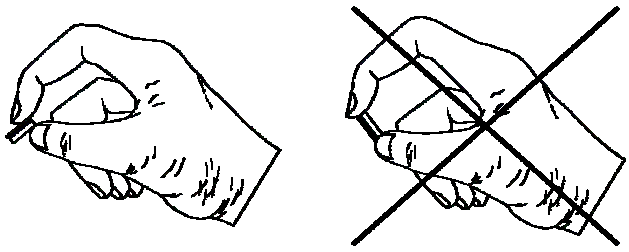
Image	LED	Description	Color	Description
	❶	Status (RUN)	Red Red with orange blinking Red/green blinking (1Hz) Orange Green Green with orange blinking	ERROR/RESET Load/unload and start BOOT AR Startup of BOOT or CF – AR SERVICE/DIAG/BOOT mode RUN RUN – BATTERY LOW
	❷	RS232 (X1)	Orange blinking	RS232: Data transfer
	❸	Profibus (RX)	Orange	Profibus: Receive data
	❹	Profibus (TX)	Orange	Profibus: Send data
	❺	CAN (RX)	Orange	CAN: Receive data
	❻	CAN (TX)	Orange	CAN: Send data

3.5 Battery Replacement

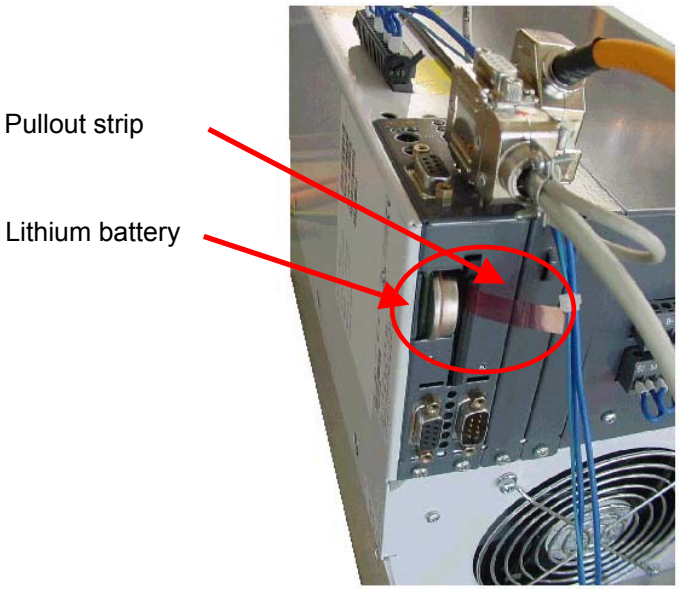
The battery of the controller has to be replaced every 5 years to prevent data loss. The control computer monitors the battery voltage and gives a warning (digital output) if the voltage drops.
The replacement of the battery may take place when the control computer is switched of or when the 24 V supply voltage is on. In some countries changing batteries is not permitted if the operating voltage is on. The data in RAM (stored positions, movement sequences, zero position...) are lost when the battery is removed when the supply voltage is off! Save the data in advance (Windows Program => Store parameters).

Procedure for battery replacement:
1. Drain electrostatic charge at the top-hat rail or the ground connection (do not reach into the power supply!).
2. Remove the cover for the Lithium battery with a screwdriver.
3. Pull on the pullout strip to remove the battery (do not grip the battery with a pair of pliers or bare pincers -> short).
   The battery may only be touched by hand at the front and backside.

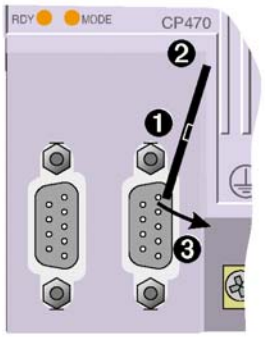
Correct: Wrong:



4. Insert new battery with correct polarity. Lift the pullout strip and push the battery with the "+"-side towards the left into the battery compartment. To make it possible to pull the battery out again, the pullout strip must be on the right side of the battery.



5. Push the end of the pullout strip that stands out under the battery, so that it does not extend from the battery compartment.
6. Replace the cover. The recess for the screwdriver should point upwards.



Lithium batteries are hazardous waste! Spent batteries have to be disposed of appropriately.

The battery has the type: CR2447N with a voltage of 3 V.

3.6 Windows Operating Program

The controller can be linked to a PC through a serial RS-232 interface. The Windows Program can be used for easy configuration of the system. No permanent connection is required. The PC is only needed for the initial operation. This is described in detail in Chapter 7.

3.7 Hand-held Display

An additional option for operating the system, in addition to using the Windows Program, is the connection of a hand-held display. It provides the easiest form of operation and can be used to make adjustments and to operate the indexer. The hand-held display is especially suited for beginners who want to use only a part of the extensive functions.

4. ACOPOS drive

To ensure that motor and drive are optimally tuned, both parts are sourced from the same manufacturer.
The drive is part of the Series ACOPOS. Special attention was given to operational safety and extensive monitoring functions.

4.1 Motor

For the motors the model 8MSA with blocking brake, Resolver and smooth shaft end are used. These three-phase synchronous motors are permanently excited, electronically commutated for applications that require excellent dynamic characteristics and positioning precision.

4.2 Motor lines

The cable shield for the motor line is connected with the ACOPOS housing via the grounding plate using the grounding clamp provided.
Please, pay attention to the correct reservation of the lines (U➔blue, V➔brown, W➔black).

4.3 Machine Zero Position

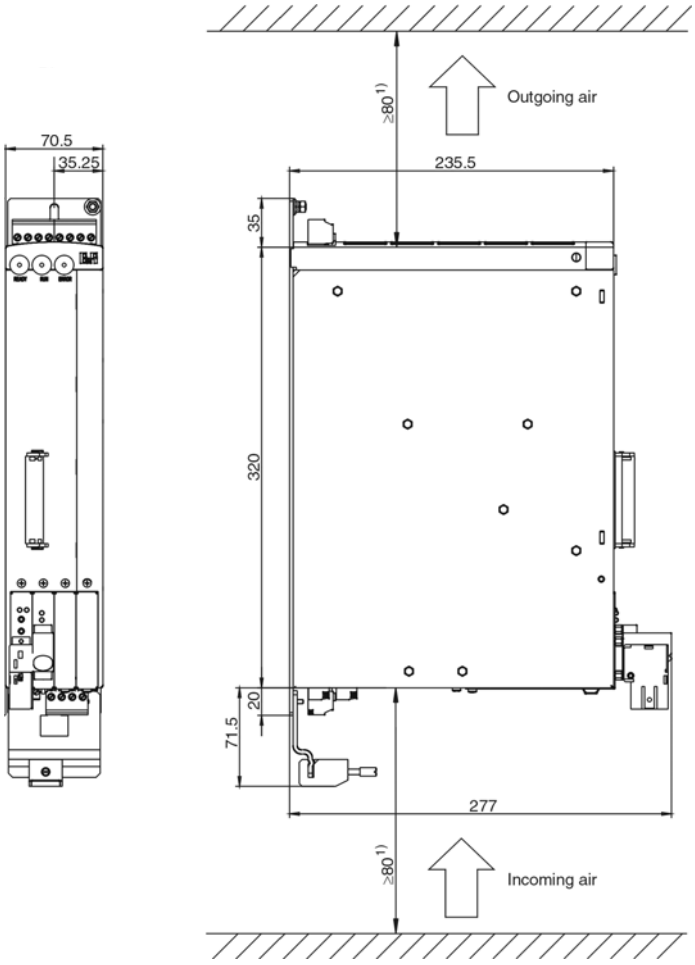
After the setting up and connection of the indexing table, you determine the machine zero position uniquely. For this you move the axis via jog mode exact to this position where the angle should 0.0° be. This will be normally the first processing stop. Then give the command "Set Zero" via the display, the Windows program or via the digital Input. As a result, you see that the actual position changes to 0.000°. You must do this only uniquely this after mounting the indexer. This offset is then stored in the battery RAM of the controller.

IMPORTANT: The machine zero position is invalid after you unmount the indexer or the plate, if you disconnect the second encoder, if you change the ACOPOS drive or if the battery is empty!

Note: Mark this place permanently (e.g. through red arrows or by a fit boring in the plate). So you can find and re-teach the machine zero position fast after a repair.

4.4 Installation of the ACOPOS drive

The ACOPOS drive may only be used in environments that comply with Pollution Level II (non-conductive pollution). The maximum operating temperature of 40 ºC (104 °F)that is specified in the technical data, as well as the protective system IP20 have to be taken into account when the system is installed.
A free space of at least 80 mm should be provided above and below the ACOPOS drive to ensure sufficient air circulation.

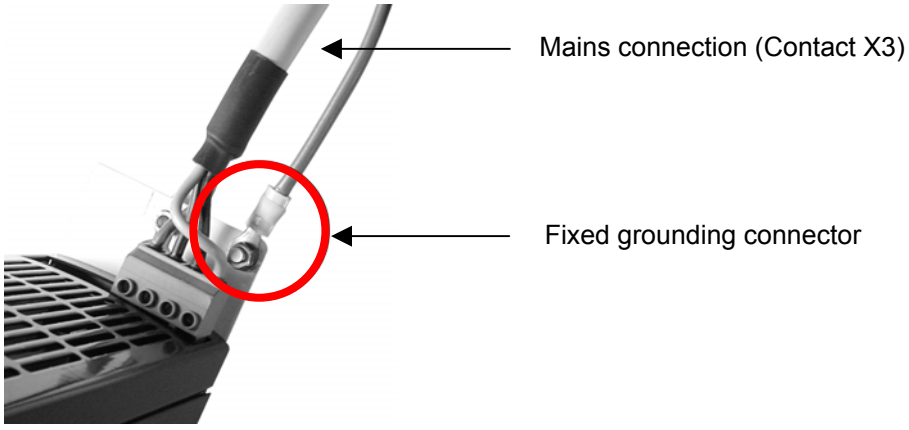


4.5 Indications

Image	LED	Description	Color	Description
	❶	READY	green	Lit when the ACOPOS drive is ready for operation (main power and clamp X1/9 HIGH)
	❷	RUN	orange	Lit when the axis is enable (hardware enable AND software enable is HIGH)
	❸	ERROR	red	Lit during POWER ON (boot procedure) Lit if hardware enable clamp X1/9 if OFF (E-STOP) Lit if an error at the ACOPOS drive exist

4.6 Power Mains Connection

The ACOPOS drive are allowed to be operated directly on grounded, three-phase industrial mains (TN, TT systems).
The power mains connection is made using terminals X3 / L1, L2, L3 and PE. The permissible supply voltage range for ACOPOS servo drive is 3 x 400VAC to 3 x 480 VAC ±10%. Always use at least 2.5mm² (or AWG12) cabling. The grounding conductor has to have the same cross section.
Servo drives are systems with an increased discharge current (larger than 3.5mA AC or 10mA DC). Therefore, a fixed (not mobile) protective grounding conductor is required on the servo drives.



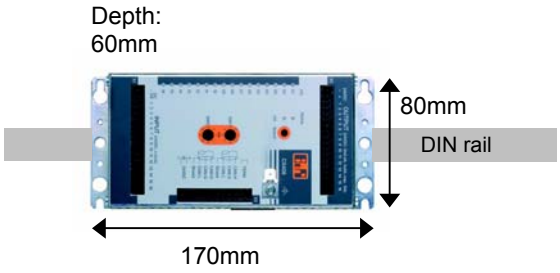
Mains fuse:
The power mains are to be equipped with over current protection in the form of a circuit breaker or a fuse. Circuit breakers (time delay) with type C tripping characteristics (according to IEC 60898) or fuses (time delay) with type gM tripping characteristics (according to IEC 60269-1) are to be used.

Fault current:
Servo drives have an internal power rectifier. If a short-circuit to the frame occurs, a flat DC fault current can be created which prevents an AC current or pulse current sensitive RCD (Type A or AC) from being activated, therefore canceling the protective function for all connected devices.
Fault current protection with a rated fault current of ≥ 100mA can be used. For example, the AC-DC sensitive, 4 pole fault current protective device F 804 from ABB (fault current: 300mA; nominal current: 63A) can be used.

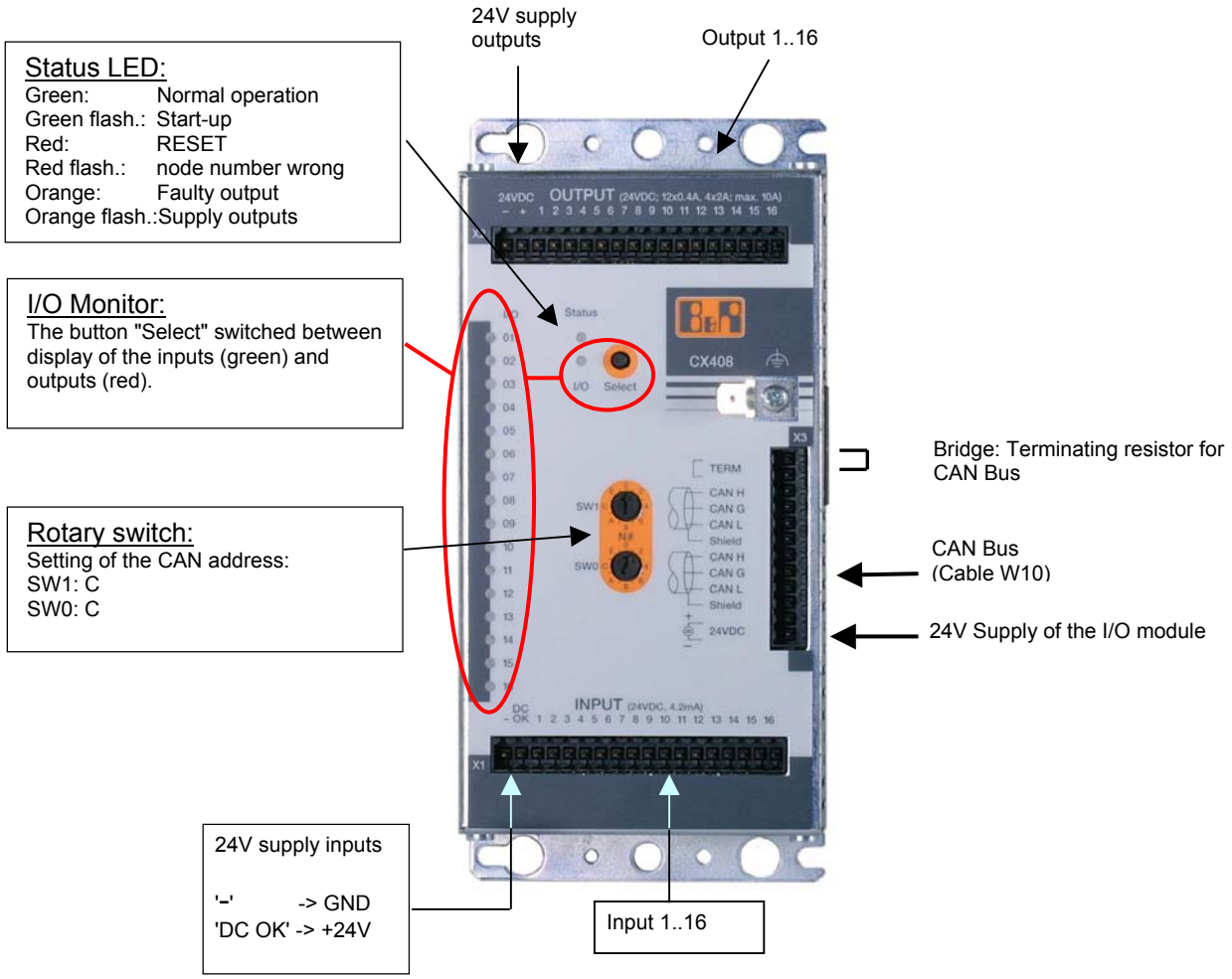
4.7 External I/O

If the bus interface (Profibus) is not used, an external I/O module can be connected. It has 16 inputs and 16 outputs with 24 V / 250 mA.
It is suited for DIN rail mounting as well as for direct attachment with screws. It can be connected to the ACOPOS drive through a CAN Bus.

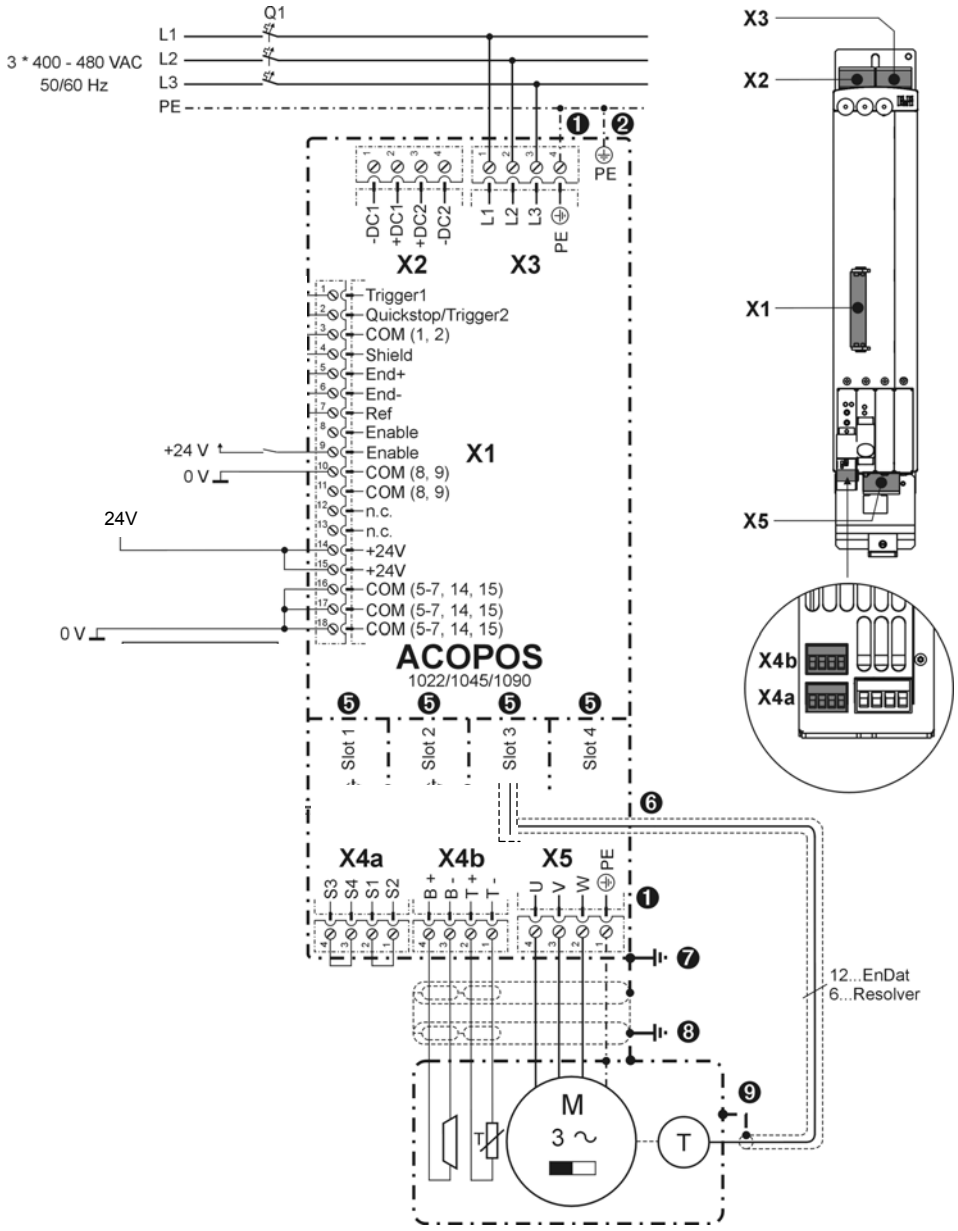
Dimensions:



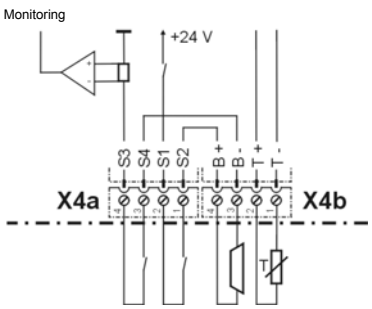
Operating elements:

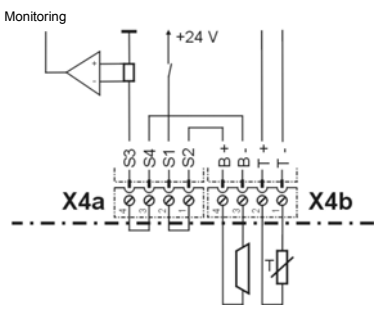


4.8 Connection Diagram



There are different ways of wiring the connector X4a for supplying power to the motor brake:





4.9 Secure Restart Inhibit

The ACOPOS drive have a built-in secure restart inhibit to guarantee that the device is stopped securely and to prevent it from restarting unexpectedly. It is designed to correspond to safety category 3 according EN 954-1.
In addition to preventing the device from restarting unexpectedly according to EN 1037, this safety function also meets the requirements of EN 60204-1 regarding the stop function for categories 0 and 1. Both stop functions require the supply to the machine drives to be switched off (immediately for category 0 and after stopping for category 1).
The restart inhibit interrupts the supply to the motor by preventing the pulse to the IGBTs. In this way, a rotating field can no longer be created in synchronous and asynchronous motors.
For this function please use clamp X1/9 at the front side of the ACOPOS drive. Clamp X1/10 is the GND. Clamp X1/9 / X1/10 is galvanic isolated from 24 V supply.

Take note that multiple errors in the IGBT bridge can cause a short advancing movement. The maximum rotary angle φ of the motor shaft that can occur during the jerking movement depends on the motor used. It is approximately 60° at the motor shaft and 0.6° at the indexer plate.

We emphasize that the integrated "secure restart inhibit" does not interrupt the voltage supply to the motor. It prevents only the build-up of a rotating field and prevents thus the start-up of the motor. If electrical work is performed on the motor, the mains power supply had to be interrupted with a mains contactor or a main switch.
Please note that at least 5 minutes discharging time for DC-bus should be provided before any electrical work is performed. When the LED's at the ACOPOS drive go off, this is not an indication that the voltages are switched off and that the DC-bus has been discharged to below 42 V!

In case of a fault of the IGBT bridge, a life-threatening DC voltage may be generated at the motor. In case of work on the motor, the mains have to be disconnected through a mains contactor or a main switch.

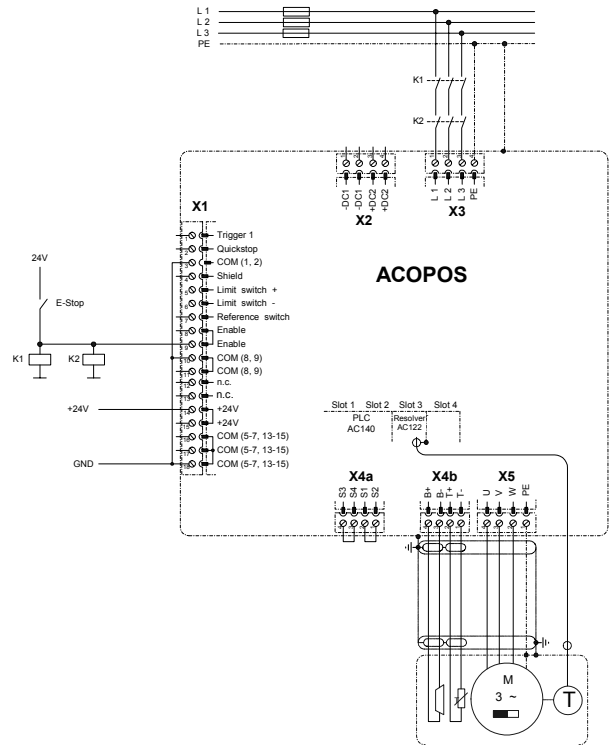
Selecting the suitable safety category must be done separately for each indexer (for each servo drive) based on a risk evaluation. This risk evaluation is a part of the total risk evaluation for the machine.

On the delivered CD-ROM, you find the manual of the drive manufacturer as soon as the TÜV Certificate
File: "ACOPOS_men_V131_04_2004.pdf", "SecureRestartInhibitTÜVCertificate_8V1180.00-2.pdf"
In the manual, you find further information in the chapter 1.3 "secure restart closure".

4.10 Schematics for E-Stop

The customer must put the indexing table into a safety category which corresponds to the danger potential of the entire machine.
For the interruption of energy supply in case of E-Stop, there are three examples given below:

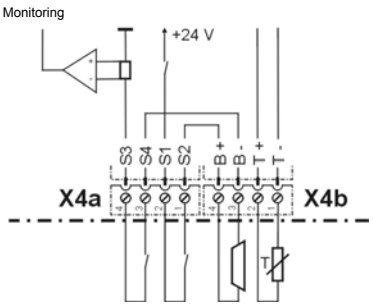
Example 1a: Interrupt of the main power



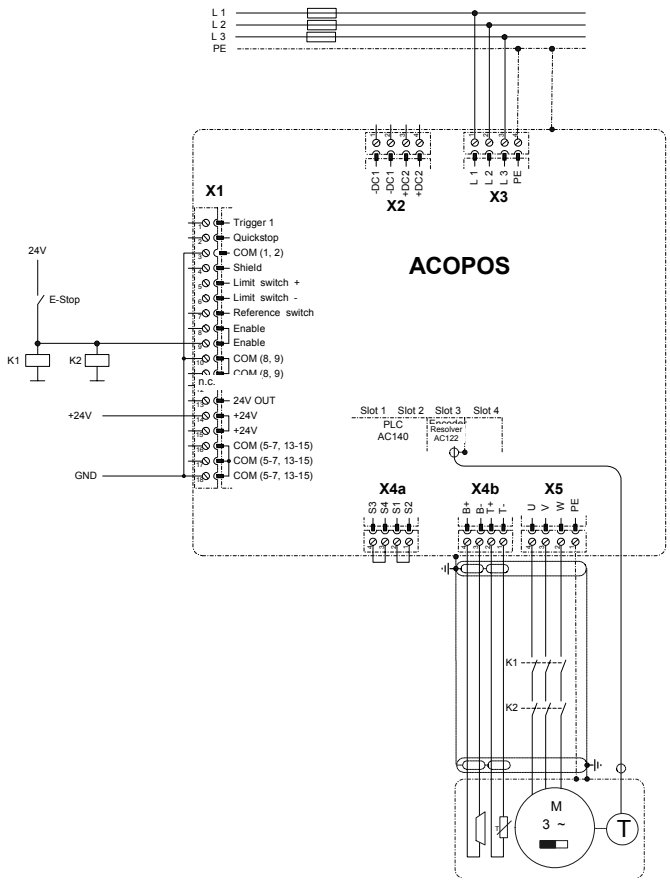
Safety considerations:
- size main contactor sufficiently
- Open **clamp X1/9** at the ACOPOS drive simultaneous with the main contactor. Because of time overlap a error ("main power low") can occur.
- **Switch-on interval: > 10sec. Please note!**
- Wait at least 5 minutes after the system has been switched off before touching live parts or disconnecting connections.
- A quick start (required when using a light curtain) is **not** possible (please consider switch-on interval).

Example 1b: Additional interruption of the brake line

Example 1a switches off the brake only when the hardware and the software is working.
When inserting contacts into the brake line (clamp 4a) the current through the brake can become intermittent. Because of time overlap an error ("brake") can occur.
If the brake is worn or has failed, the motor will take longer to stop. The axis then spins out. Please consider this during design of your machine and the classification into a safety category.



Example 2a: Interrupt of the motor lines

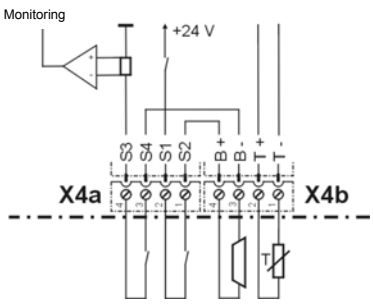


Safety considerations:

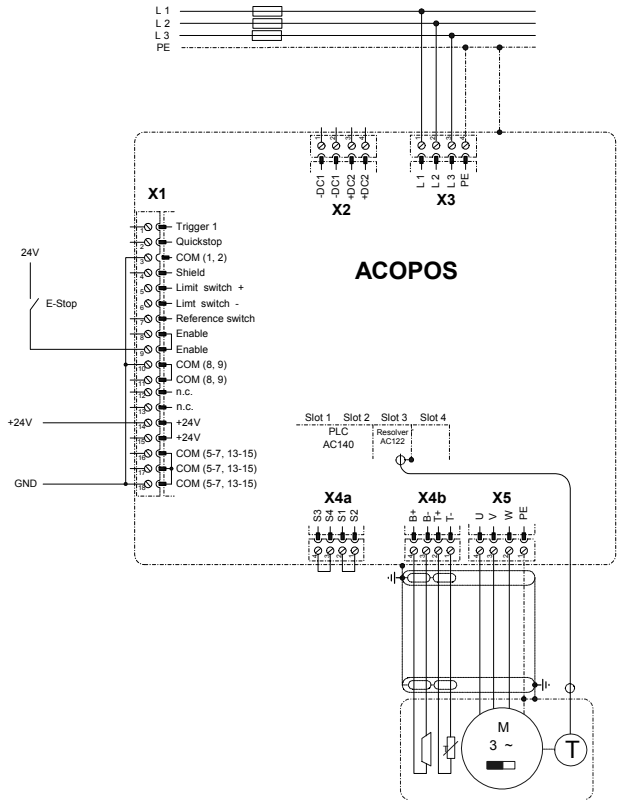
- size main contactor sufficiently
- Open clamp X1/9 at the ACOPOS drive simultaneous with the main contactor. Because of time overlap a error (“motor phase“) can occur. If the clamp X1/9 is not opened a defect in the ACOPOS drive can occur. An opening of the clamp X1/9 takes care besides of the contacts of the contactor since the ACOPOS drive is disabled before opening the contacts and the motor current is interrupted (switching the contacts without power).
- A quick start (required when using a light curtain) is possible.

Example 2b: Additional interruption of the brake line

As shown in example 1b, the current through the break can be interrupted.
If the brake is worn or has failed, the motor will take longer to stop. The axis then spins out. Please consider this during design of your machine and the classification into a safety category.



Example 3a: Interrupt clamp X1/9 at ACOPOS drive

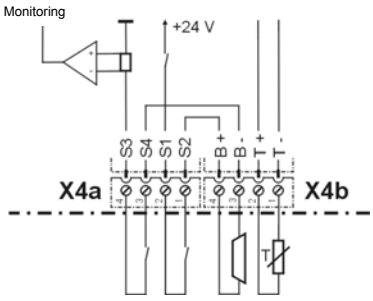


Safety considerations:

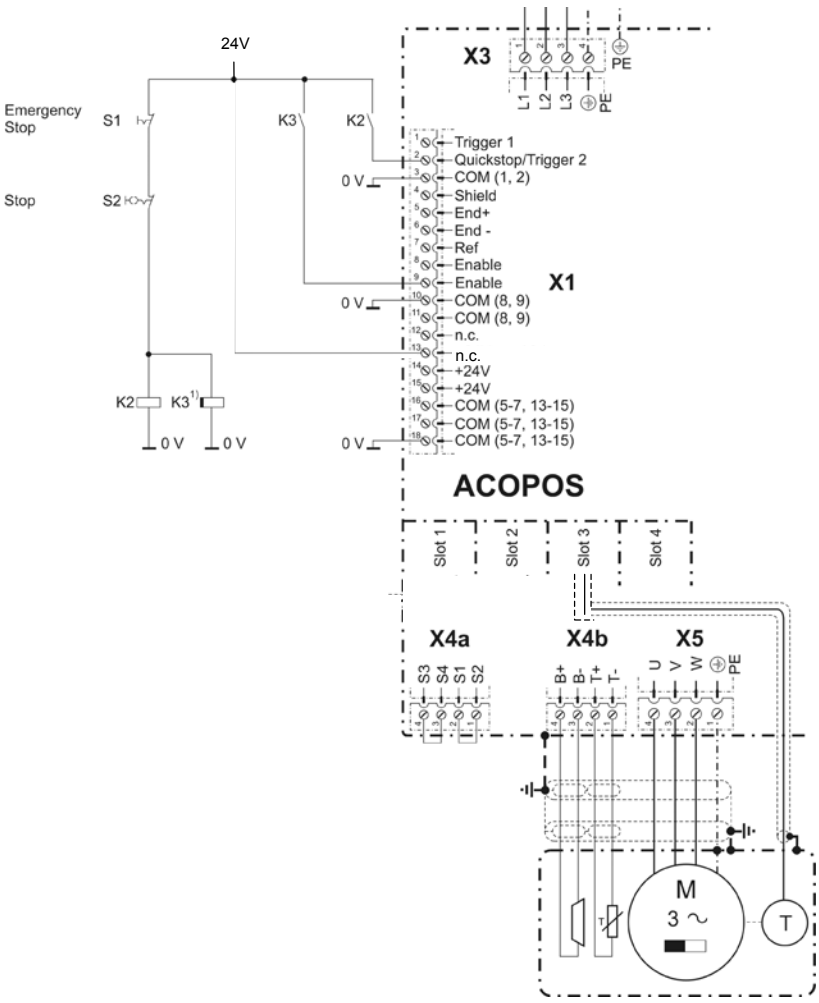
- Please see chapter 4.9 (secure restart inhibit)
- For frequent switching (no switch-on interval)
- Wear resistant
- A quick start (required when using a light curtain) is possible.
- **Meets the requirements 3 of EN 954-1 (secure restart inhibit, safety category 0, 1, 2)**
- **Motor clamps (U, V, W) can also lead tension after shutdown (of clamp X1/9). Electric works on the indexer are not allowed. You have to interrupt the main power.**

You'll find further information in the ACOPOS user's manual (see File "ACOPOS_men.pdf" on added CDROM) chapter 5.1.2, page 126.

The current through the brake can still be interrupted besides:

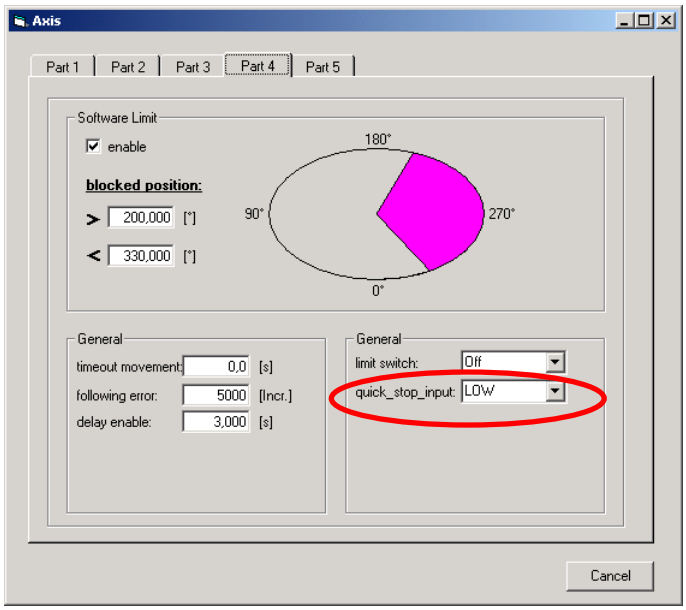


Example 3b: Additional use of Quickstop Input (clamp X1/2 at ACOPOS)

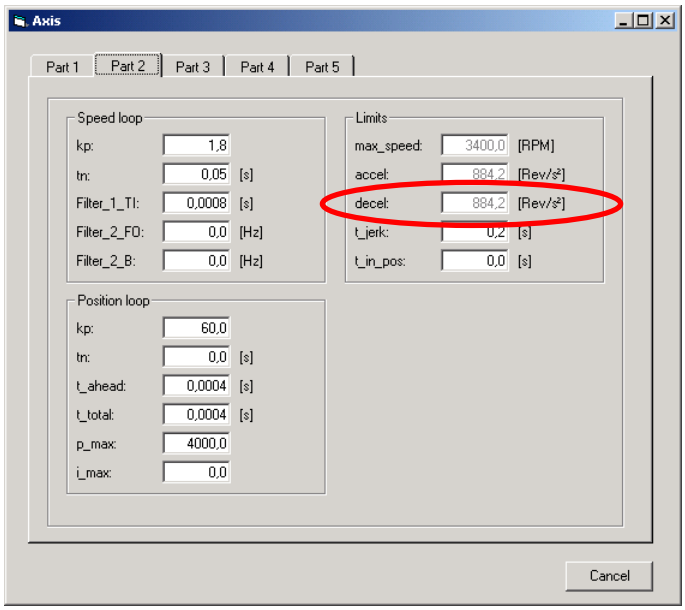


1.) The contactors K2 / K3 must correspond to the respective safety category.
3.) ACOPOS drives without 24VDC output (ACOPOS 1022/1045/1090), must be supplied externally. An interrupt of the 24V will stop the brake and the axis spin out (and/or the mechanical brake in the motor fails). An error (temperature, following error, ..) or an interrupt at the main power (clamp X3) also interrupts the active (electrical) braking.

Pressing the E_Stop switch S1 causes relay K2 to be released. In this way, the ACOPOS input “Quickstop” triggers active braking. If the drive, etc. is faulty, then auxiliary relay K3 is released after a defined delay and causes the energy feed to the motor to be cut off. The customer has set the delay time to the calculated time of the stop ramp.
With this, you got the shortest braking time.



The customer has configure the input “Quickstop“ via the Windows Program (NR_indexer_BR.exe).



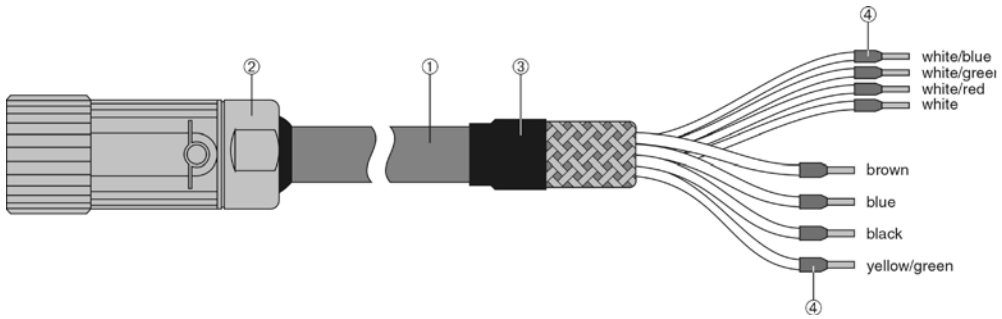
The limit values (deceleration ramp) describes the stop ramp.

The customer **must** carry out and check these settings independently (after every change in settings).

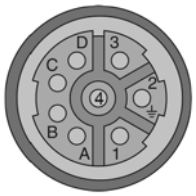
He can use the oscilloscope function in the software.
This is to be considered especially, if a light curtain is used.
For Quickstop use clamp X1/2 at the front side of the ACOPOS drive. Clamp X1/3 is GND.

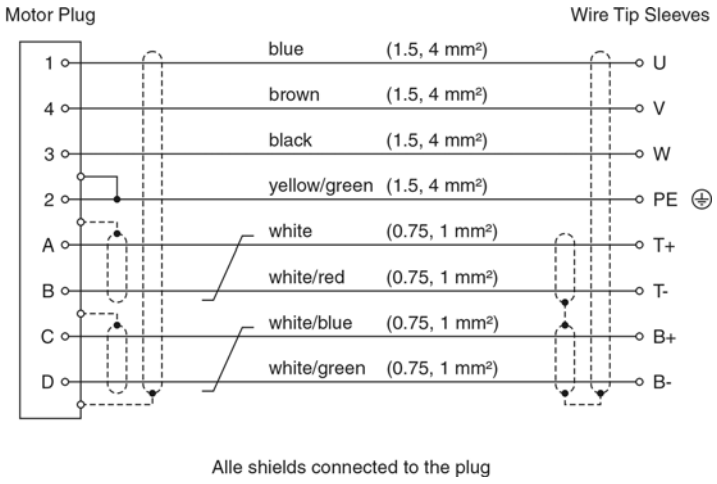
4.11 Cable

Motor cable construction (W1):



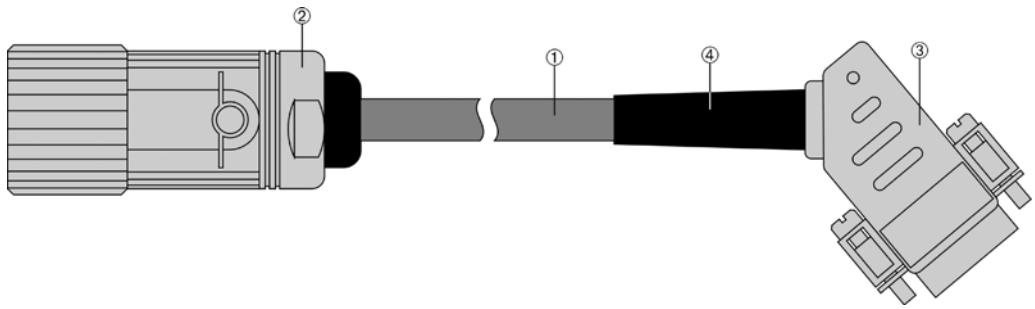
Item	Description	Remark
1	Motor lines	4 x 1.5 mm² + 2 x 2 x 0.75 mm²
2	Circular connector	BSTA 108 FR 19 08 0006 000
3	Shrink wrap	
4	Wire tip sleeve	

Circular connector	Pin	Description	Function
	1	U	Motor connection U
	4	V	Motor connection V
	3	W	Motor connection W
	2	PE	Protective ground conductor
	A	T+	Temperature sensor
	B	T-	Temperature sensor
	C	B+	Brake +
	D	B-	Brake -

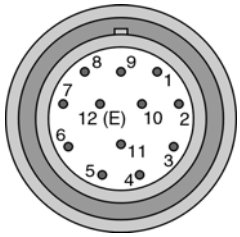


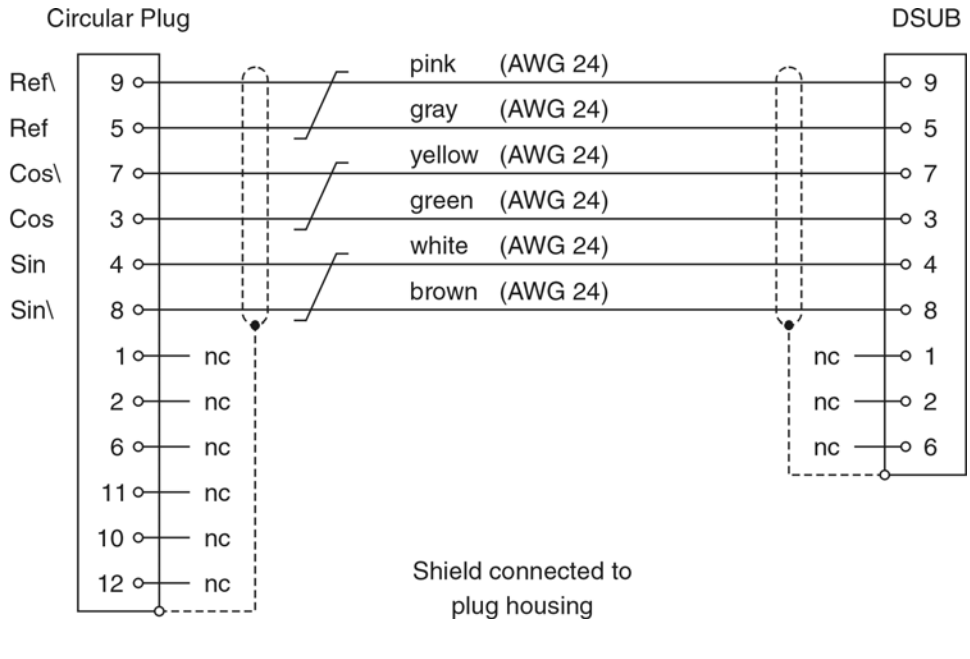
Cable lengths: 5m, 10m, 15m, 20m, 25m available

Structure of the Resolver cable (W2 / motor encoder):

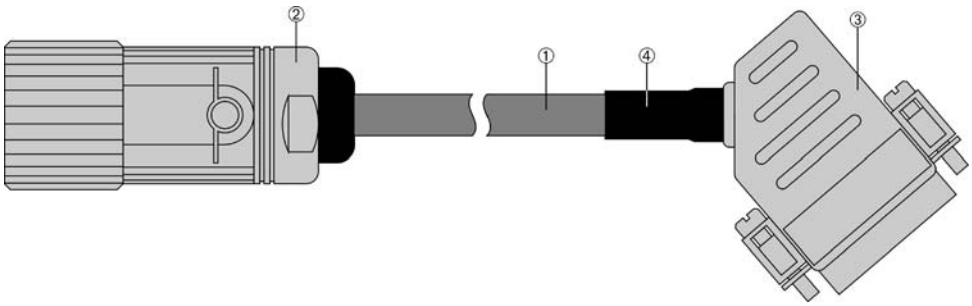


Item	Description	Remark
1	Encoder cable	3 x 2 x 0.25 mm²
2	Circular connector, 12-pin socket	ASTA 021 FR 11 10 0005 000
3	DSUB-housing 45°, 9-pin plug	
4	Shrink wrap	

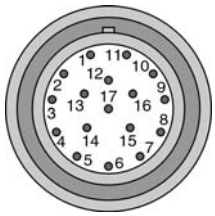
Circular connector	Pin	Description	Function
	1	---	
	2	---	
	3	Cos	Cosinus input
	4	Sin	Sinus input
	5	Ref	Reference output
	6	---	
	7	Cos\	Cosinus input inverted
	8	Sin\	Sinus input inverted
	9	Ref\	Reference output inverted
	10	---	
	11	---	
	12	---	

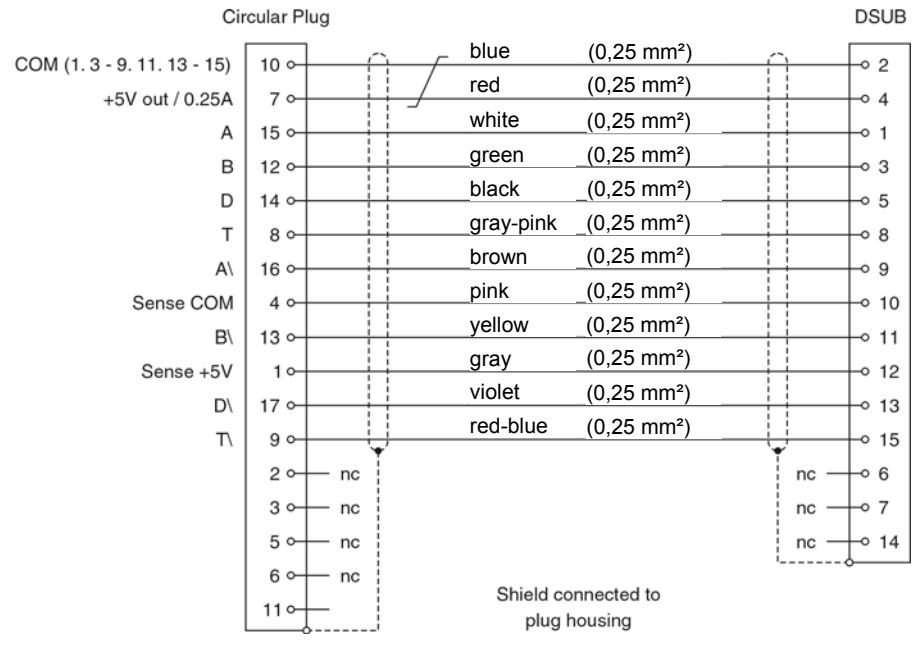


Structure of the encoder cable (W3) (to Heidenhain Encoder):



Item	Description	Remark
1	Encoder cable	5 x 2 x0,25mm² + 2 x 0,5mm²
2	Circular connector, 17-pin socket	ASTA 035 FR 11 12 0005 000
3	DSUB-housing 45°, 15-pin plug	
4	Shrink wrap	

Circular connector	Pin	Description	Function
	15	A	Channel A
	10	COM (1, 3-9, 11, 13-15)	Encoder supply 0V
	12	B	Channel B
	7	+5V out / 0.25A	Encoder supply +5V
	14	D	Data input
	8	T	Clock output
	16	/A	Channel A inverted
	4	Sensing COM	Sense input 0V
	13	/B	Channel B inverted
	1	Sensing +5V	Sense input +5V
	17	/D	Data inverted
	9	/T	Clock output inverted



5. Description of the user interface

The digital interface is described first. The Profibus interface is built in a similar way, but offers the option to transmit numerical values (nominal position, actual position, fault number...).

5.1 Overview of Terminals

Inputs:

Terminal on I/O-extension (CX408)	Function	Remark
X1-1	GND (0V)	24V-supply of the inputs
X1-2	+24V / DC_OK	24V-supply of the inputs
X1-3	E 1.1	Parameterise through Windows Program
X1-4	E 1.2	Parameterise through Windows Program
X1-5	E 1.3	Parameterise through Windows Program
X1-6	E 1.4	Parameterise through Windows Program
X1-7	E 1.5	Parameterise through Windows Program
X1-8	E 1.6	Parameterise through Windows Program
X1-9	E 1.7	Parameterise through Windows Program
X1-10	E 1.8	Parameterise through Windows Program
X1-11	E 1.9	Parameterise through Windows Program
X1-12	E 1.10	Parameterise through Windows Program
X1-13	E 1.11	Parameterise through Windows Program
X1-14	E 1.12	Parameterise through Windows Program
X1-15	E 1.13	Parameterise through Windows Program
X1-16	E 1.14	Parameterise through Windows Program
X1-17	E 1.15	Parameterise through Windows Program
X1-18	E 1.16	Parameterise through Windows Program

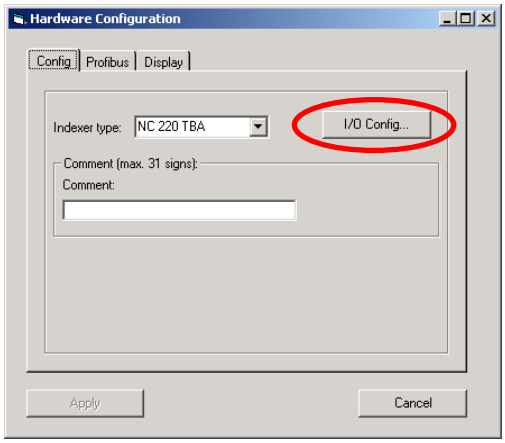
Outputs:

Terminal on I/O-extension (CX408)	Function	Remark
X2-1	GND (0V)	24V-supply of the outputs
X2-2	+24V	24V-supply of the outputs
X2-3	A 1.1	Parameterise through Windows Program
X2-4	A 1.2	Parameterise through Windows Program
X2-5	A 1.3	Parameterise through Windows Program
X2-6	A 1.4	Parameterise through Windows Program
X2-7	A 1.5	Parameterise through Windows Program
X2-8	A 1.6	Parameterise through Windows Program
X2-9	A 1.7	Parameterise through Windows Program
X2-10	A 1.8	Parameterise through Windows Program
X2-11	A 1.9	Parameterise through Windows Program
X2-12	A 1.10	Parameterise through Windows Program
X2-13	A 1.11	Parameterise through Windows Program
X2-14	A 1.12	Parameterise through Windows Program
X2-15	A 1.13	Parameterise through Windows Program
X2-16	A 1.14	Parameterise through Windows Program
X2-17	A 1.15	Parameterise through Windows Program
X2-18	A 1.16	Parameterise through Windows Program

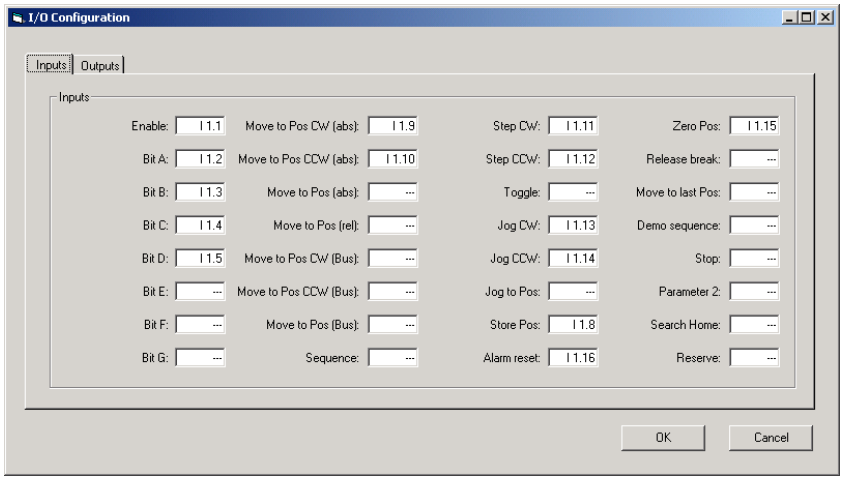
5.2 Terminal Description

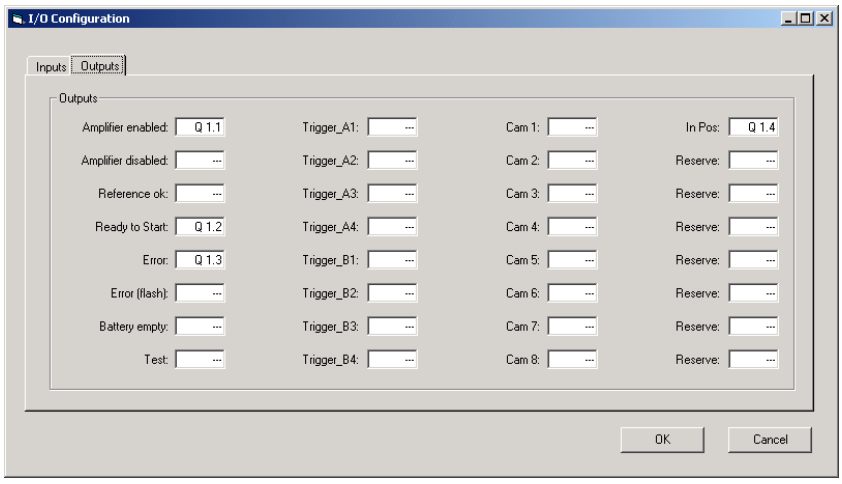
The terminal allocation can be freely configured through the Windows Program. As there are more functions than input terminals, a selection must be made.

To allocate terminals, the dialog box below is called from the Windows Program with: "Options->HW_Config->I/O_Config…". To set the parameters for a digital input/output, an entry such as "E1.1" or "A1.1" is required. To allocate functions on the Profibus an entry such as "Bit 1" is required.
Profibus and digital I/Os can be mixed as required.



Example: Use of digital I/Os:





Inputs:

ENABLE (must be connected by the user)
At HIGH level the output stage of the ACOPOS drive is enabled, at LOW it is blocked.
This enable signal (software enable) is AND-linked with the contact X/19 on the ACOPOS drive. The motor can therefore also be disabled from the customer PLC. The contact X1/9 (at the ACOPOS drive) is intended for connection to the EMERGENCY-Stop circuit.
The following has to be taken into account for door circuits: The ACOPOS drives are only switched off if the output "Disable" is HIGH. Only then, the lock of the doors may be opened.

The input "Enable" on the PLC alone does not meet the requirements of the regulations for EMERGENCY-Stop and door circuits, as it requires a functioning link (CAN Bus) between PLC and the ACOPOS drive, functioning software and functioning connection to the output. To obtain the full EMERGENCY-Stop functionality, the contact X1/9 at the ACOPOS drive or the power supply of the ACOPOS drive has to be interrupted.

If you do not require software enable input, you can simply ignore this function (I/O_Config: write "---"). Enable is then only via the hardware input (clamp X1/9) possible.
That can be helpful if you use only Profibus interface and you want running the indexer the first time by using the jog mode (without pro bus master).
Some customers want to block the indexer after a step. During the customer time (load/unloading the indexer) they want to block the indexer to avoid unintentional movements. For this the "STOP" input is better because the position controller is switched off if you disable the axis. When the position loop is open the indexer lost his position.

Bit_A..Bit_G: Coding of commands
At these inputs the position or sequence numbers for the following commands are provided:
- Jog to Pos No. xxx
- Move to Pos No. (CW, CCW, abs, rel) xxx
- Start Sequence No. xxx
- Store Pos. No. xxx

Numerical values between 0 and 127 can be provided. This number is read when there is an rising edge in one of the above signals.
The numbers are provided in binary form.
e.g. Position Number 2: `0000010`
e.g. Position Number 3: `0000011`
e.g. Position Number 12: `0001100`
e.g. Position Number 45: `0101101`
e.g. Position Number 83: `1010011`

These Inputs are also used for the commands “JOG“ and “STEP“.

In the hardware configuration (Menu: HW_Config) of the Windows Program, these functions (Bit_A..Bit_G) are assigned to the corresponding input terminals. If the 127 possible positions are not required, only the required functions (Bit_A..Bit_G) have to be assigned. Unassigned functions are automatically set to "0".

Move to Pos CW (abs)
At an rising edge at this input, the indexer moves to the absolute position number that is provided at the inputs Bit_A..Bit_G. The direction of rotation is right (CW). This signal normally starts a positioning process.
The signal is closely associated with the output "Ready to Start". As soon as this output is HIGH, the signal "Move to Pos" is accepted. As soon as this command is accepted, the output "Ready to Start" goes LOW. Now the "Move to Pos" input must become LOW. As soon as the axis has reached the position window, the output "Ready to Start" goes HIGH again and a new start-command can be accepted (see timing diagram at the end of the chapter).
The position number 0 has a special function. The user has therefore positions 1..127 freely available. For each of these 127 positions an individual speed override can be set through the Windows Program. These preset values are then multiplied with the general speed override (0..100%).
If an invalid position number is provided or the position has not yet been teached, an error message occurs.

Special function:
- A reference run is started by providing the Position Number 0 and the command “Move to Pos“ (only for indexer without an absolute encoder).

Move to Pos CCW (abs)
As above, direction of rotation is left (CCW).

Move to Pos (abs)
As above. The direction of rotation is selected to ensure that the axis moves the shortest way.

Move to Pos (rel)
This command is similar to the command above. However, the position values teached are here interpreted as relative values. The position number 0 is here invalid.

Example:
Current position: 45.0°
Teached position: 10.0°
=> The axis moves to 55.0°

Move to Pos CW (Bus)
Like the command "Move to Pos CW (abs)", but no teached position number is used. The target position and the maximum speed are provided on the Profibus.

Move to Pos CCW (Bus)
As above, direction of rotation is left (CCW).

Move to Pos (Bus)
As above. The direction of rotation is selected to ensure that the axis moves the shortest way.

Special function: If you set the three inputs (“Move to Pos CW (Bus)”, “Move to Pos CCW (Bus)”, “Move to Pos (Bus)”) together to HIGH, the position in the Profibus telegram is interpreted as a relative position.

Sequence
With the rising edge, the Sequence No.xxx (the number is binary coded on the Inputs Bit_A..Bit_G) starts. Only after all commands have been completed, the output "Ready to Start" goes HIGH again. This function is otherwise identical with "Move to Pos". Sequences with the numbers 1..10 are available. The commands for the sequences are described in detail in the following chapter.

Step CW
This command produces one step of the indexing table in direction CW. The rotation angle depends on the selected graduation (see dialog box "axis").
The inputs Bit_A..Bit_G have depending of the configuration “indexer steps” in the dialog box “axis” as special function:
a.) mathematic calculated steps
The inputs Bit_A..Bit_G selected a position in the table “teached positions”. The position in the table is used as an offset.
Example 1:
4 steps, Bit_A..Bit_G == 0 => The indexer moves to the positions 0° / 90° / 180° / 270°
Example 2:
4 steps, Bit_A…Bit_G == 3 => Position in the table no. 3 = 5.0°
=> The indexer moves to the positions 5° / 95° / 185° / 275°

Also the speed entry (override 0..100%) from the table is used.

b.) steps teached in the table
In the dialog box “axis” the initial value and the number of steps is defaulted. With the number, build by Bit_A..Bit_G, the initial value is moved.
Example 1:
Bit_A..Bit_G == 0, 4 steps, initial value == 1 => The positions no 1 / 2 / 3 / 4 from the table “stored positions” are started.
Example 2:
Bit_A..Bit_G == 8, 4 steps, initial value == 1 => The positions no 9 / 10 / 11 / 12 from the table “stored positions” are started.

The offset from Bit_A..Bit_G is used to set an offset in case of an product alternation, or to set different speeds (position entry in the table = 0.0°). Normal these inputs (Bit_A..Bit_G) are LOW.

Step CCW
As above, only rotation direction CCW

Toggle
This input is valid only if you define two steps (dialog boxes "axis"). With each rising edge the indexer toggle between position no. 1 and position no. 2 (direction changes left/right)

Jog CW
As long as this input is HIGH, the indexer moves with jogging speed in direction CW.
The inputs Bit_A..Bit_G defines an override for the speed. The override is taken from the table “stored position”. But normally these inputs are LOW.

Jog CCW
As long as this input is HIGH, the indexer moves with jogging speed in direction CCW.
Inputs Bit_A..Bit_G as above.

Jog to Pos
The indexer moves with jogging speed to the provided position number (Bit_A..Bit_G), i.e. the axis moves first slowly and then increasingly faster. If the signal goes LOW, the indexer stops immediately, even if the target position has not been reached. No completion message is provided when the position has been reached. The signal is only used for the startup operation and is not intended for permanent operation. The position number 0 (reference run) is not valid.

Store Pos
With rising edge on this input the actual position is stored at the position number that is provided at the inputs Bit_A to Bit_G. Position number 0 is not valid.

Alarm Reset
An rising edge (>20 ms) acknowledges all pending fault messages.
Alternatively, the faults can be acknowledged through the Windows Program or the hand-held display.

Zero-Pos
With an rising edge the actual position is set to 0.000° (axis is zeroed). This zero position is now used as starting point for all movements. It is assumption that the axis is Enabelt.

Release brake
Can be used to open the brake manually. Requirement is the operating mode "Axis disabled".

Move to last Pos
With this command the indexer moves to the previous position, e.g. after opening the door circuits the axis is slightly pulled off its position. The command can be used to reproduce the position the axis had before opening the door circuits.

Demo sequence
An rising edge starts the demo sequence. It is used, for example, for the startup operation of the axis or for demonstrate the functions.
The demo sequence must first defined in the Windows Program at the menu "Demo sequence". The commands available are the same as for the normal sequence. The difference to the sequence is, that the demo sequence works in an endless loop, i.e. after the last command it jumps automatically to the first command. The sequence is stopped through the input "Stop" or through the Windows Program.

Stop
This command stops all started movements ("Move to Pos", "Sequence", "Demo-Sequence").
This command does not affect the jogging function.

Some customers requests, if movement is ended and he begins processing (e.g. loading / unloading the indexer) that the indexer does not start unintentionally, and causes a crash (with high material damage). For this, this stop input would be able to be used. It is also possible to remove the input "Enable" alternatively. However, this would result that the position loop is disconnected and the position is not checked and correct no more. An small drifting from the position away is to be found then (<0.1°).

The stop command is not intended for an Emergency-Stop. For this purpose, the input "Enable" (clamp X1/9 at the ACOPOS drive) must used.

Parameter 2
This is used to switch to the Parameter Set 2, which is defined in the dialog box "axis". It includes values for speed, start ramp, stop ramp and jogging operation.

Search Home
Because using an absolute encoder, this input is not used.

Outputs:

Amplifier enabled
As soon as the ACOPOS drive has been switched on with the Input “Enable”, this signal goes HIGH. This signal is not protected against cable breakage, i.e. if the signal goes LOW it cannot be concluded that the indexer cannot move anymore.

Amplifier disabled
As soon as the Input "Enable" goes LOW and all movements have stopped, this signal goes HIGH to indicate that the doors can now be unlocked.

Reference OK
This output indicates that a valid reference point is provided. Only then, the moving commands “Move to Pos“, “Start Sequence“ and “Store Pos“ can be executed. (Only relevant for indexer without an absolute encoder).

Ready to Start
This output indicates that the ACOPOS drive is ready to accept a new start command.

Error
This output indicates that an error has occurred.

Error (flash)
This output can be used to connect a light that flashes in case of an error.

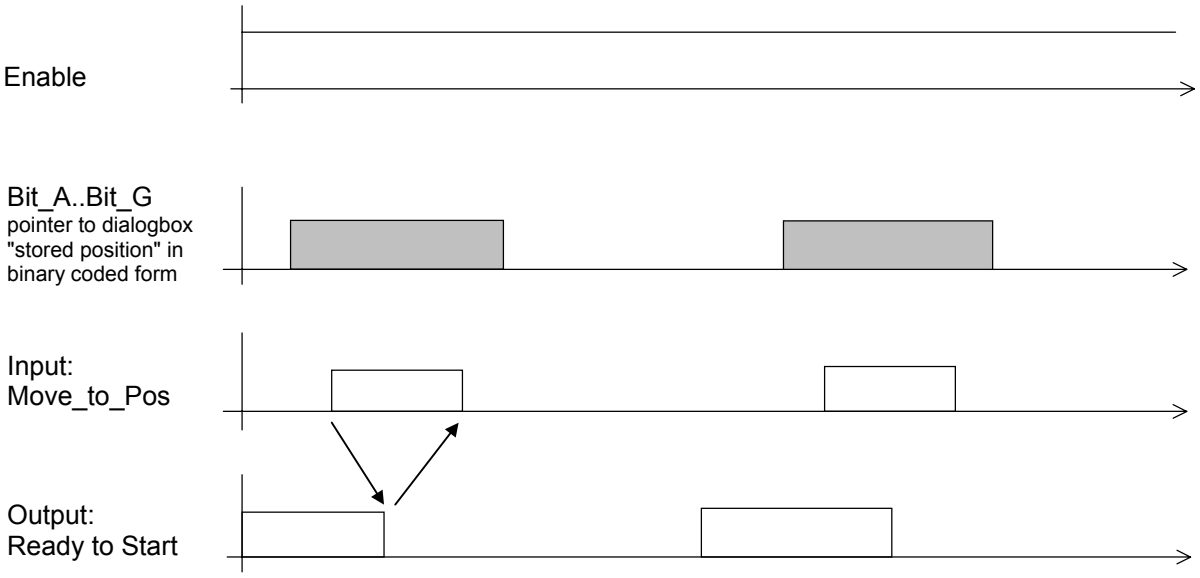
Battery_Warning
If this output goes HIGH, it indicates that the battery should be exchanged.

Trigger_A1..Trigger_B4
These outputs can be set from a sequence. Trigger_A: These outputs are automatically reset after a sequence has been completed or terminated (e.g. error message or door circuit opened). The outputs of the group Trigger_B are retained, until they are reset by a command.

Cams 1...8
A maximum of 8 cams can be defined through the Windows Program. These are the corresponding outputs.

InPos
This output indicates that the axis has reached the target position of the last movement command. It is comparable to a cam, for which the position is set to the target position for every movement command. The size of the cam is set in the dialog box "axis" (Part 1, Input Field: "InPos").

5.3 Timing diagram



5.4 Including the Profibus

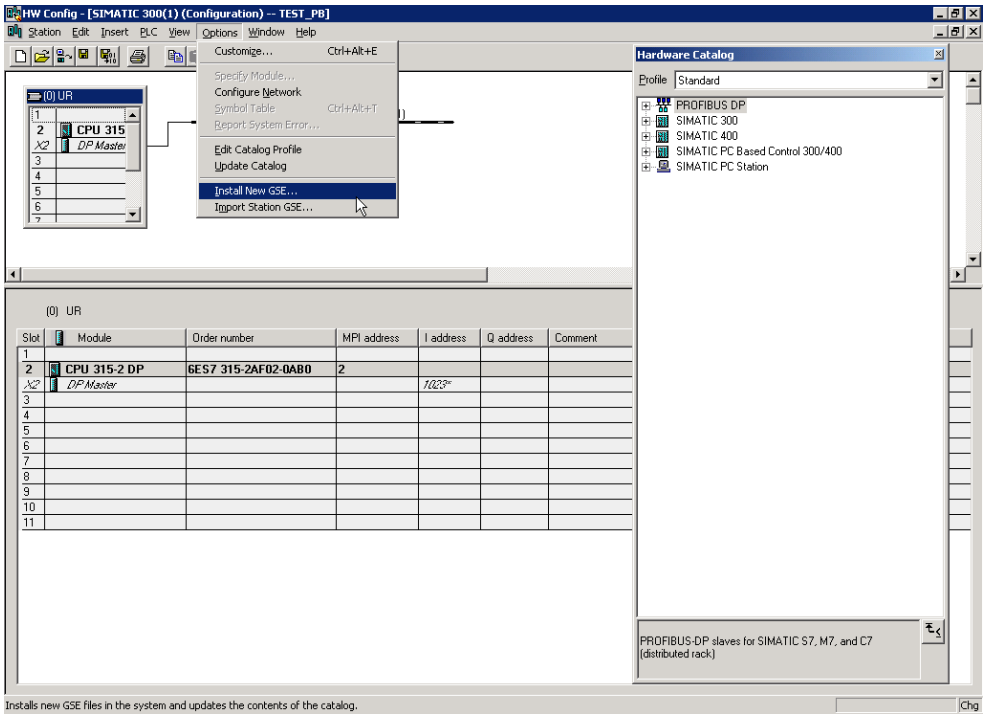
This chapter explained you, how to parameterise the Profibus interface.
Chapter 5.4.1 explains the works on the Profibus master side, that is on a Siemens S7 by using a S7-300.
Chapter 5.4.2 explains the parameterisation at the B&R ACOPOS drive.
Additional you can use the parameter channel. You'll find this docu in an own file at the CD ROM "Profibus_Parameter_Channel_en.pdf"

5.4.1 Parameterising the Profibus Master

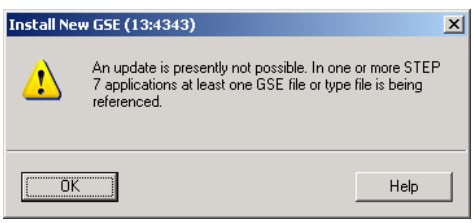
1. Generate a new project. Here e.g. with a S7-300 PLC.

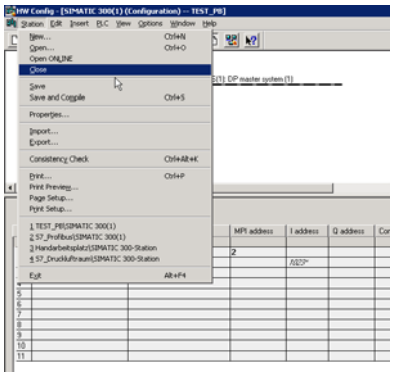
Remark: If you have only a few stations, a baud rate from 1.5Mbits/s satisfies. As a result, you have the same reaction time as in the case of 12Mbits/s. In this way, you can even achieve advantages in the case of a bad line quality.

2. Install new GSE file:

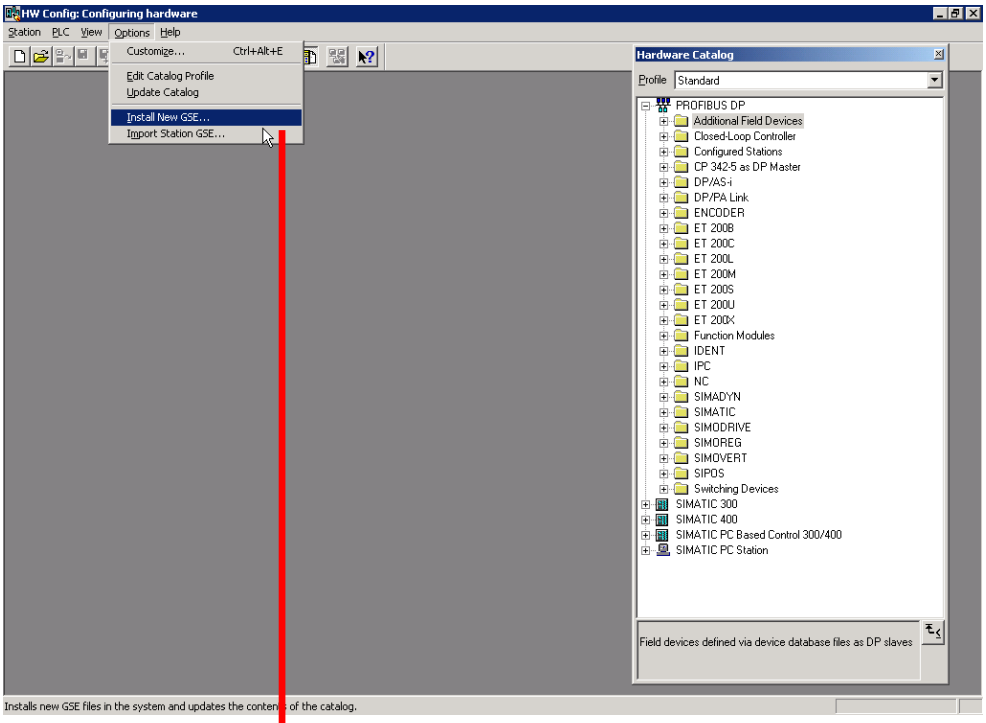

HW Config - [SIMATIC 300(1) (Configuration) -- TEST_PB]
Station Edit Insert PLC View Options Window Help
Customize... Ctrl+Alt+E
Specify Module...
Configure Network
Symbol Table Ctrl+Alt+T
Report System Error...
Edit Catalog Profile
Update Catalog
Install New GSE...
Import Station GSE...
Hardware Catalog
Profile Standard
PROFIBUS DP
SIMATIC 300
SIMATIC 400
SIMATIC PC Based Control 300/400
SIMATIC PC Station
(0) UR
CPU 315
DP Master
Slot Module Order number MPI address I address Q address Comment
CPU 315-2 DP 6ES7 315-2AF02-0AB0 2
DP Master
PROFIBUS-DP slaves for SIMATIC S7, M7, and C7 (distributed rack)
Installs new GSE files in the system and updates the contents of the catalog.

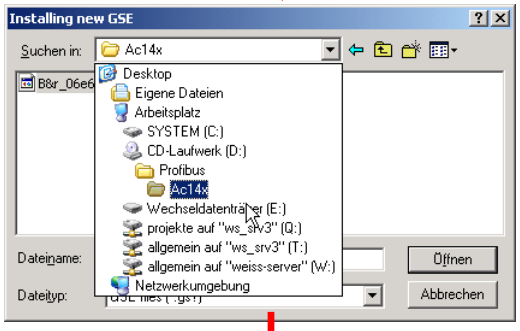
Remark:
If a GSE file is already referenced, you must at first close all stations in order to be able to import the GSE file. After the import of the GSE file you open the stations again.

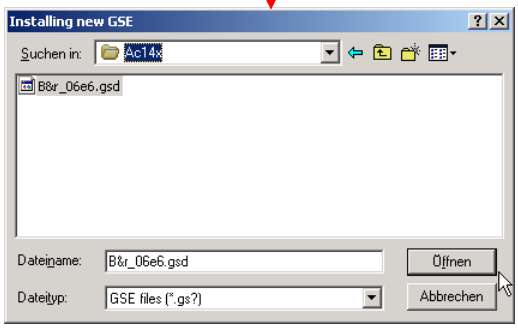

Install New GSE (13:4343)
An update is presently not possible. In one or more STEP 7 applications at least one GSE file or type file is being referenced.
OK
Help



3. Select GSE file from CD ROM

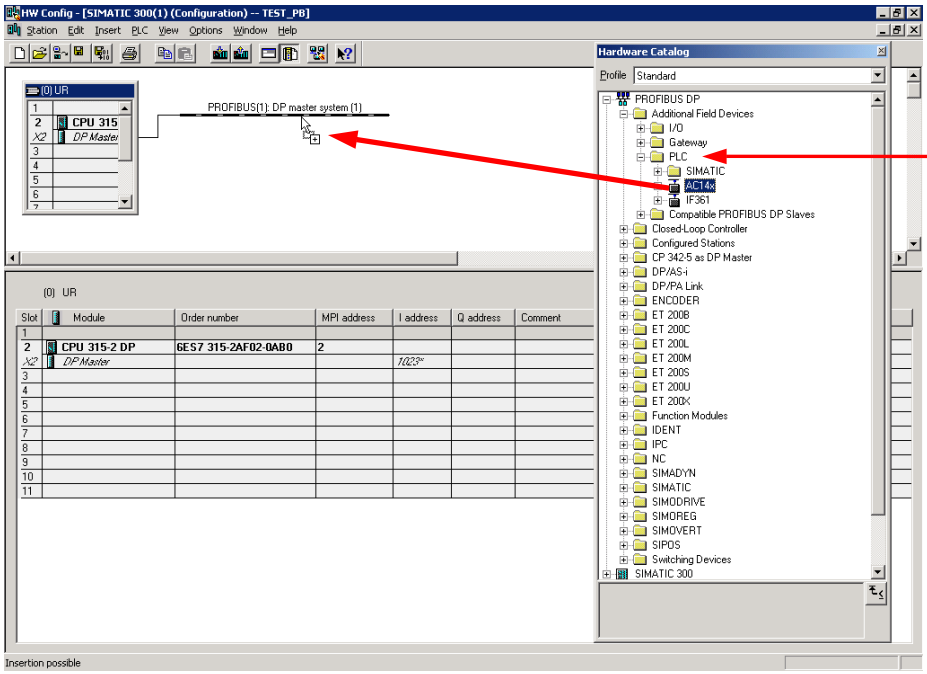






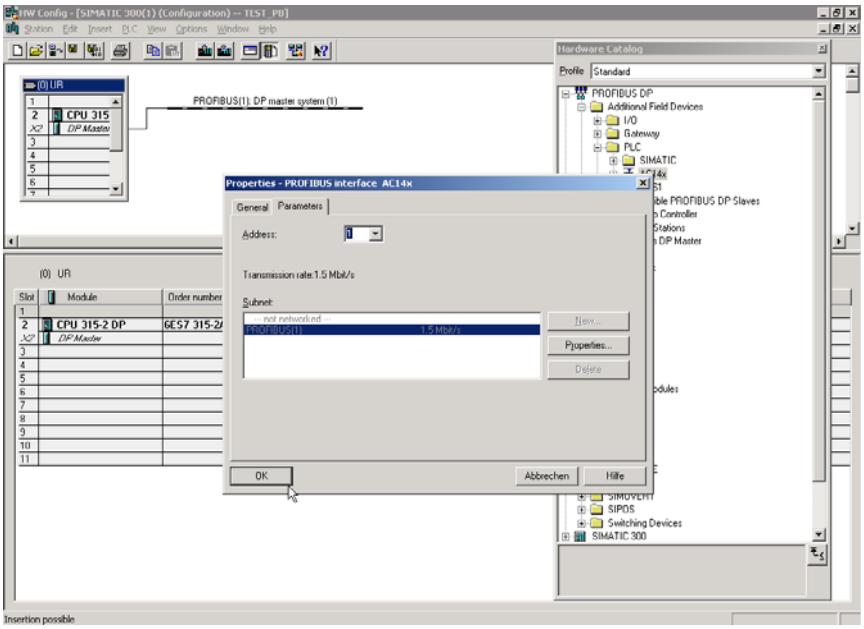
Rem.:
You'll find the GSE file at the CD ROM in the folder:
"Profibus / Ac14x"

4. Now find in the hardware catalog under “PROFIBUS DP / Additional Field Devices / PLC“ the imported file for the Profibus interface “AC140”.
Mark it and drag it to the Profibus master system by pressing the left mouse key.

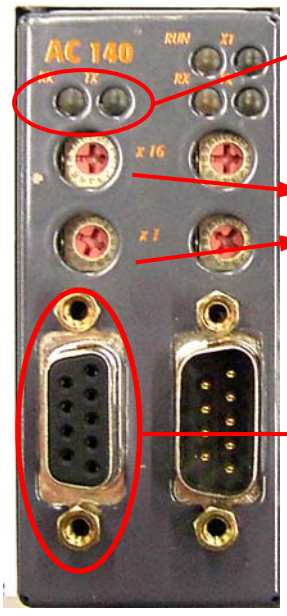


5. Now a dialog box is opened, where you can set the slave address.
These address must be agree with the switches at the front of the slot PLC (AC140) in the ACOPOS drive.

Rem.: You can change the address later at any time.

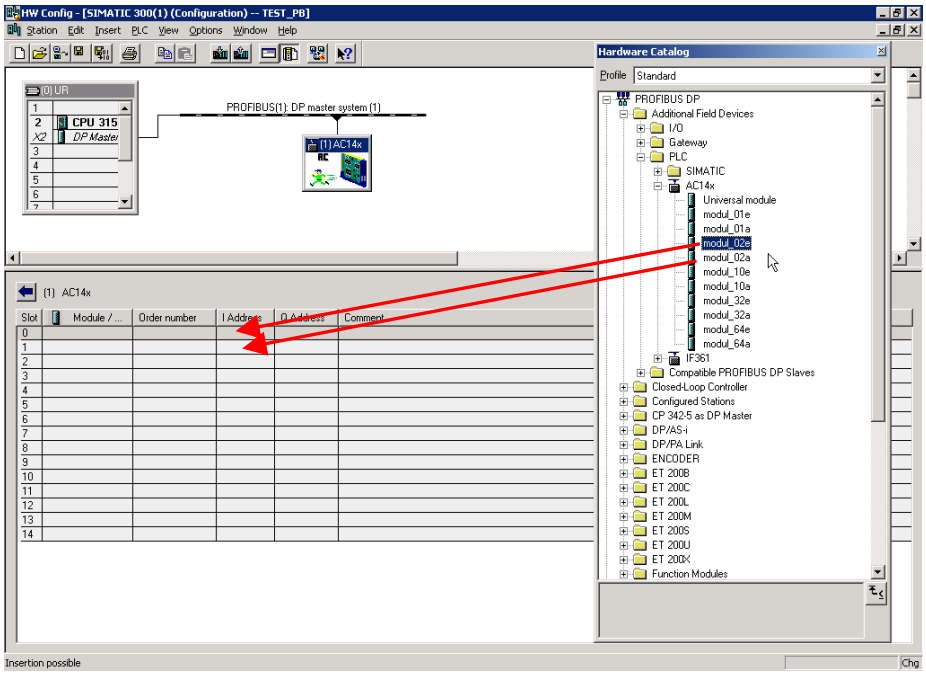


Profibus address at the slot PLC “AC140“ (ACOPOS drive)

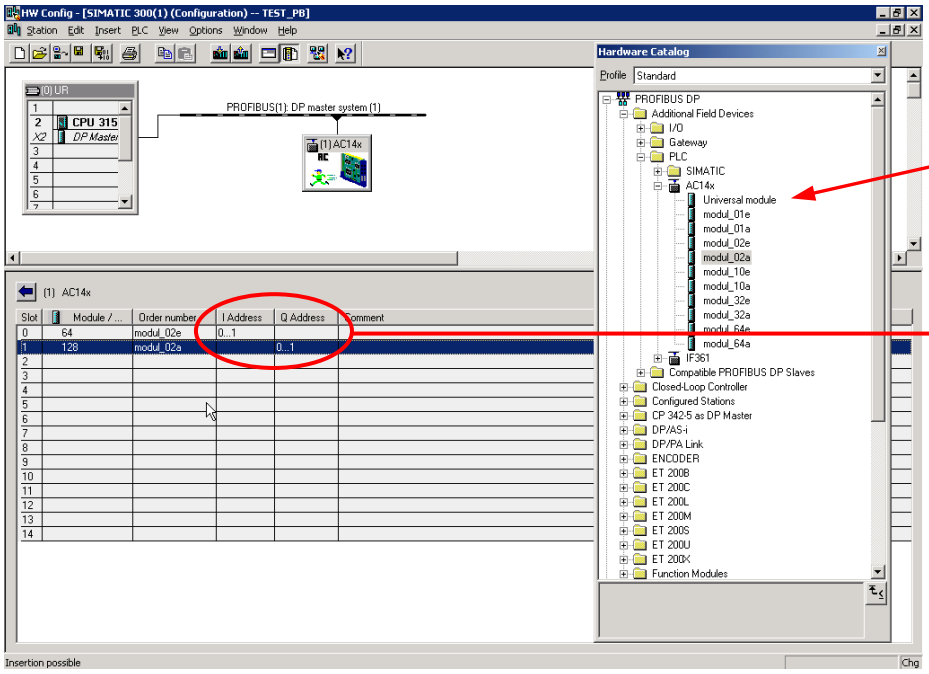


6. Now define the inputs and outputs:
In this example, 2Byte inputs (16Bit) and 2Byte outputs (16Bit) are defined. The S7 software allocate a free I/O address. You can change it each time.

Rem.: If you want to send the actual- and nominal positions of the axis in addition to the 16 bit inputs and outputs, choose a telegram length of 10Byte.



Mark the corresponding module and drag it into the left table.

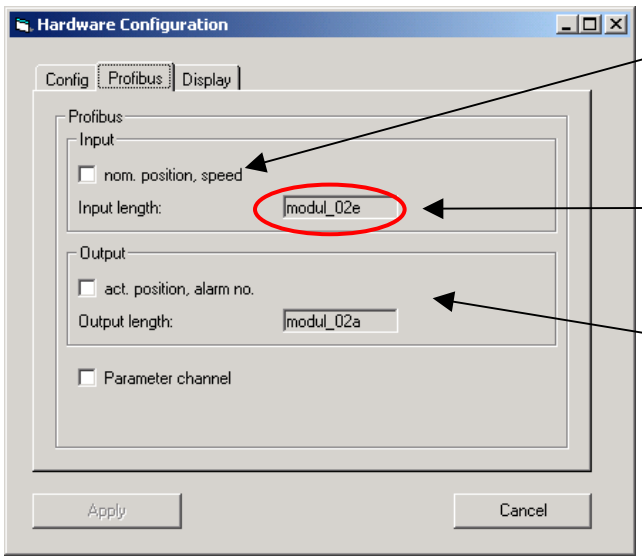


To get data consistency please use “Universal module”

The S7 software allocate a free I/O address.
Here in this example:
I0.0 ... I1.8 and Q0.0 ... Q1.8

5.4.2 Parameterisation of the B&R ACOPOS drive

If the Profibus is used, the Profibus message can be configured. It can be determined if only the digital inputs and outputs (Chapter 5.2) should be send, or if the nominal and actual positions should be send as well. The additional information increases the length of the Profibus message (from 2 Bytes to 10 Bytes).



Select whether the nominal position and the nominal speed should be send as well.

Display of the new message length.
The shown text "modul_02e" or "modul_10e" corresponds to the configuration selection in the Profibus-S7 Master-System.

The same applies to the send message.

The Profibus message is structured as follows:

Receive:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9

Byte 0: Digital inputs Bit 0... Bit15 (Chapter 5.2)
Byte 1: Digital inputs Bit16...Bit31 (Chapter 5.2)
Byte 2: Reserve
Byte 3: Reserve
Byte 4: Nominal position (LO-Byte)
Byte 5: Nominal position
Byte 6: Nominal position
Byte 7: Nominal position (HI-Byte)
Byte 8: Nominal speed (LO-Byte)
Byte 9: Nominal speed (HI-Byte)

Remark:
- Nominal position: This is the nominal position to which the axis moves when the command “Move to Pos Bus“ is executed. The nominal position is standardised to 0.001°, i.e. a numerical value of 90000 is interpreted as 90.000°. The valid numerical range is 0..359999 (0..359.999°).
  The byte order was selected to allow direct mapping of the 32-bit numerical value to a Bit Memory Double Word (MDW) or a double word in a Data Block (e.g. DB7.DBD100). Re-sorting of the byte order of the 32-bit value in the Siemens S7 is not required.

- Nominal speed: The speed (0..100%) for the command “Move to Pos Bus“ is set here. The value is standardised to 0.01%, i.e. a numerical value of 10000 is interpreted as 100.00%

Send:

Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8	Byte 9

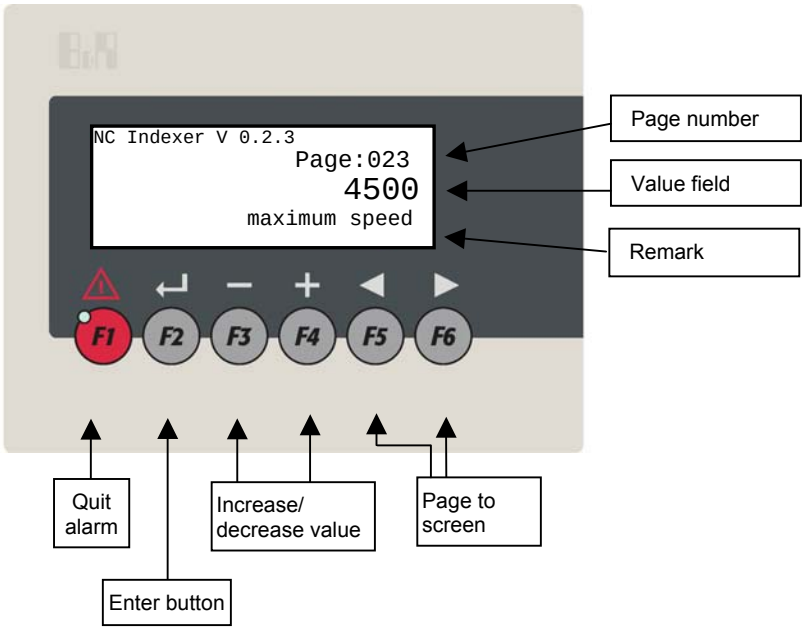
Byte 0: Digital outputs Bit0... Bit15 (Chapter 5.2)
Byte 1: Digital outputs Bit16...Bit31 (Chapter 5.2)
Byte 2: Reserve
Byte 3: Reserve
Byte 4: Actual position (LO-Byte)
Byte 5: Actual position
Byte 6: Actual position
Byte 7: Actual position (HI-Byte)
Byte 8: Fault No. (LO-Byte)
Byte 9: Fault No. (HI-Byte)

Remark:
- Actual position: The value for the actual position is standardised to 0.001°, i.e. a numerical value of 90000 is interpreted as 90.000°.

6. Hand-held Display

It is possible to operate the indexer from a hand-held display for simple applications. To achieve the full functionality, the Windows Program has to be used.

6.1 Structure and operation



The buttons F5 / F6 are used to page between screens.

The buttons F3 / F4 ("+" / "-" buttons) are used to increase/decrease a numeric value. During this process the value field flashes. The value is first written into an intermediate buffer and then accepted with the button F2 ("Enter" button). After acceptance, the value field stops blinking.

The button F1 is used to acknowledge error messages.

You'll find a summary of the error codes below in chapter 9.

Brightness:
Brightness can be switched darkly by pressing the buttons "F2" and "F3" together.
Brightness can be switched lightly by pressing the buttons "F2" and "F4" together.

6.2 Input fields

Screen No.	Function
1	Operating message (only display)
2	Alarm message (only display)
3	Actual position (only display)
4	Cycle time (only display)
11	Set zero position
12	Jogging operation
13	Step (manual operation)
15	Start demo sequence
20	Indexer type
21	Indexer graduation
22	Mass inertia of the load
23	Max. speed
24	Start-ramp
25	Stop-ramp
26	External brake resistor
30	Select language

Description in detail:

Page 1: Operating message: The current state of the control system is shown (e.g. "Ready for Operation", "Motor turns", "Waiting for Command"...).

Page 2: Display of the current fault message

Page 3: Display of the current position (rotating angle of the indexer in degrees)

Page 4: Display of the movement time of the last movement command

Page 11: The button F2 sets the current position to 0.000° (zero calibration).
Button F3 and F4 can be used to move the indexer in jogging mode.

Page 12: The "+" and the "-" button can be used to move the indexer in jogging mode.

Page 13: The "+" button starts a step in clockwise direction. The "-" button starts a step in counter-clockwise direction.

Page 15: The button F2 starts/stops the demo sequence

Page 20: Setting of the indexer type

Page 21: Setting of the indexer graduation

Page 22: Setting of the mass inertia of the load. This may result in different start/stop ramps.

Page 23: The maximum motor speed can be set here. Note: By defining the indexer type the upper limit is automatically set.

Page 24: Setting of the start ramp
Note: By defining the indexer type as well as the mass inertia, the upper limit is automatically set.

Page 25: Setting of the stop ramp
Note: By defining the indexer type as well as the mass inertia, the upper limit is automatically set.

Page 26: Configuration: External brake resistor present (yes/no). Switching is only possible when the drive has been disabled (axis disabled, e.g. by Emergency-Off, etc.).

Page 30: The language of the hand-held display can be set here.

7. Windows Program

7.1 Program Installation

The programs were developed in Microsoft Visual Studio and require an up to date computer for installation (Windows 95 or newer, Internet Explorer 5.5 or newer, due to the installed drivers).

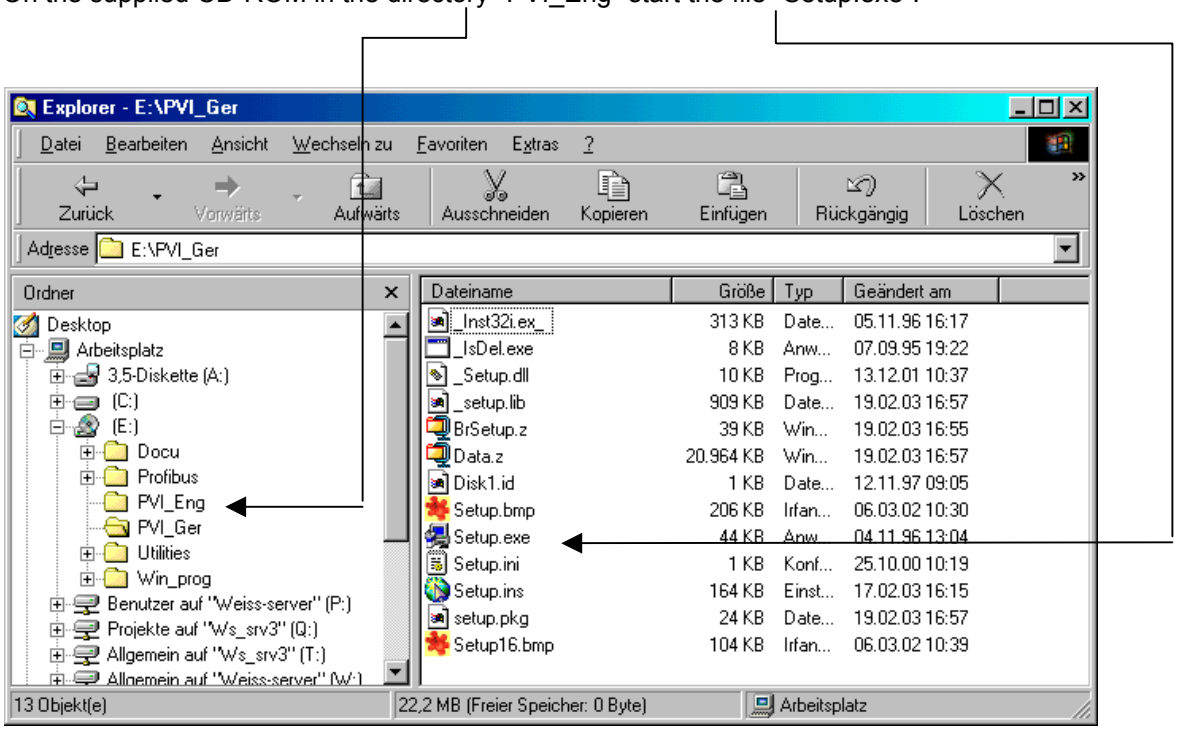
Please make sure to read the Readme file on the CD-ROM.

Procedure:

The installation of the Windows Program is performed in two steps:
- Installation of the PVI monitor for communication between the ACOPOS drive and the Windows computer
- Installation of the program "NC_Indexer_BR.EXE"

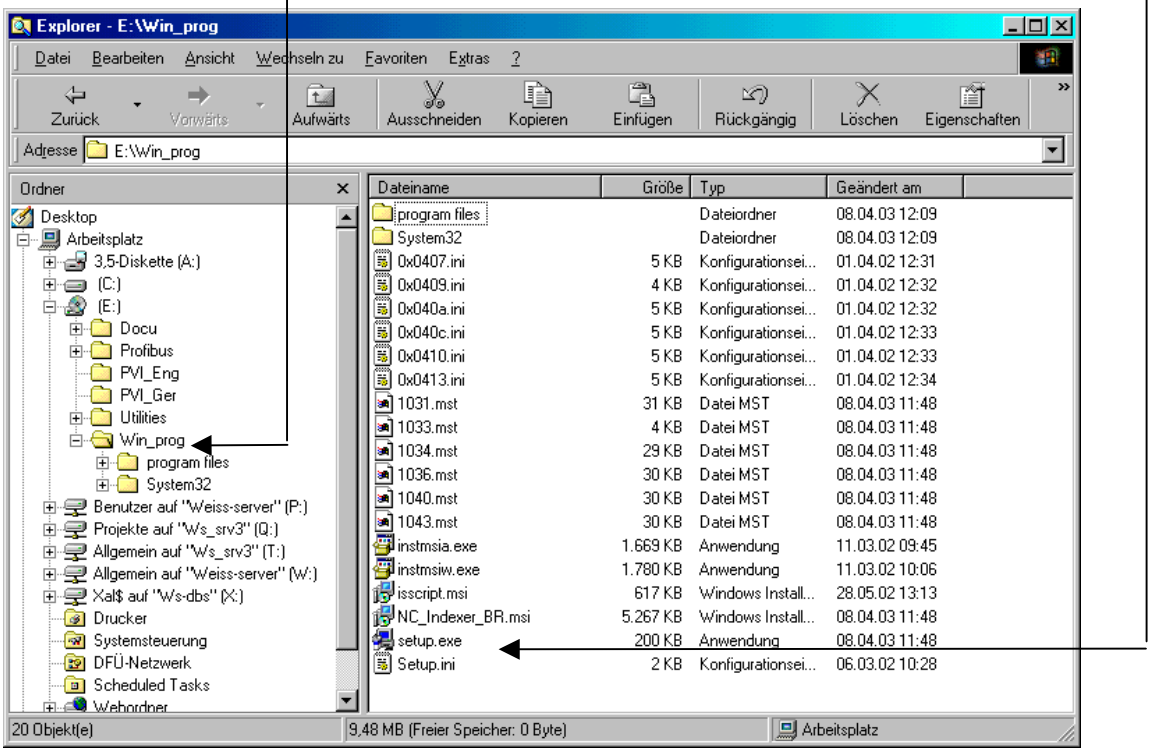
Installation of the PVI monitor:

On the supplied CD-ROM in the directory "PVI_Eng" start the file "Setup.exe".



Installation of the Windows Program:

On the CD-ROM in the directory "Win_Prog" start the file "setup.exe".



7.1.1 PVI Monitor

General:

The PVI monitor is used as a driver between the Windows Program and the ACOPOS drive. It is provided by the manufacturer of the drive (B&R). The PVI monitor runs license-free for 2 hours. An error message will appear when the two hours are exceeded. When "NC_Indexer_BR.EXE" is restarted, the program is ready to run for another two hours.
Alternatively, a security key or a safety code is available.
The driver has a wide range of functions. It connects all kinds of serial interfaces of the PC with the ACOPOS drive. PCMCIA adapters or USB adapters (USB to RS-232) can also be used. This is becoming increasingly important for the operation with laptop computers. It is further possible to connect a modem into the RS-232 line.

The connection cable is arranged as follows:

```
Pin 2  <-----> Pin 3
Pin 3  <-----> Pin 2
Pin 5  <-----> Pin 5
```

This cable is delivered with the CD-ROM.

During the installation of the PVI monitor, an OPC driver can be installed as well. It makes it possible to connect the ACOPOS drive to professional visualisation programs (WinCC, Intellution, Wonderware...) to achiever the same functionality that the program "NC_Indexer_BR.EXE" provides.

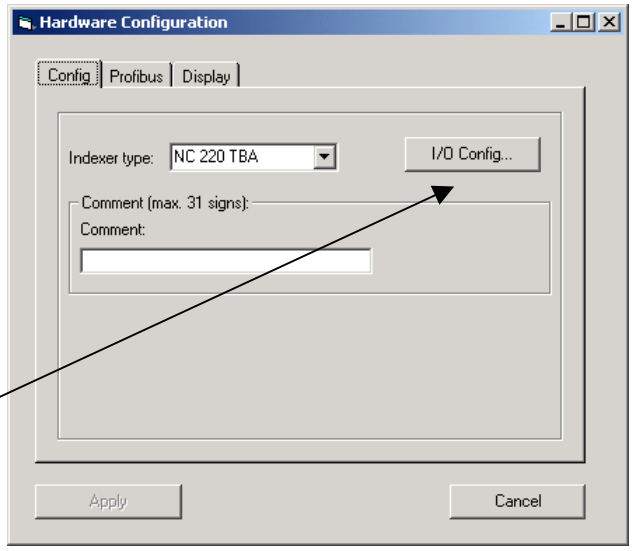
7.2 Operation of the program

The Windows Program has the following functions:

- Configuring (Axis, Profibus...)
- Debug (I/O-Monitor, Parameter download)
- Teach positions
- Create sequences

7.2.1 Configure

Under the menu item: "Options->HW_Config..." the indexer type as well as the I/O configuration and Profibus are configured first => See example in Chapter 8



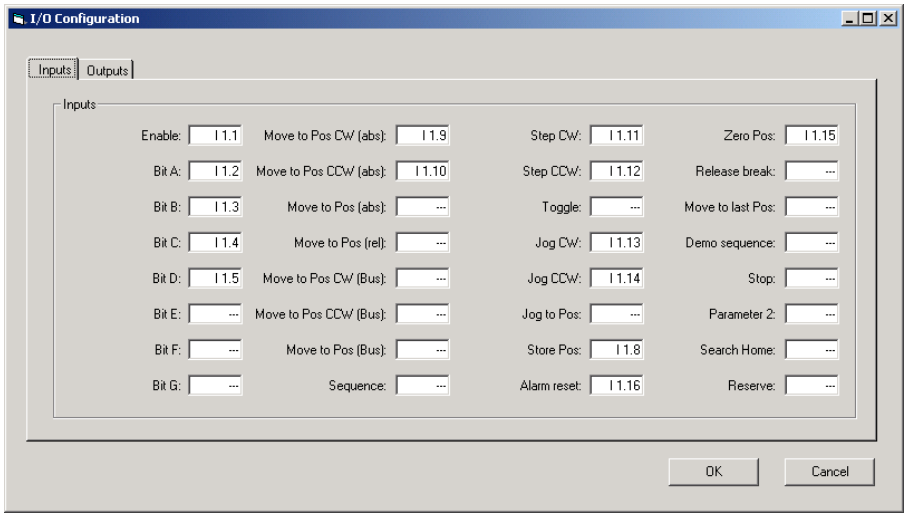
1. The indexer type (NC220TBA,...) is entered first. This makes it possible to load the default parameters for this system type.
2. The name of the system (e.g. welding robot...) can be entered in the comment field.
3. If a Profibus is used, one can configure whether the actual position nominal position or alarm number should transmitted. The Profibus address is set with DIP switches on the PLC (see circuit diagram).
4. Under the "I/O Config..." button, the individual functions of the input terminals (or the bits at the Profibus) are allocated.

Example 1:

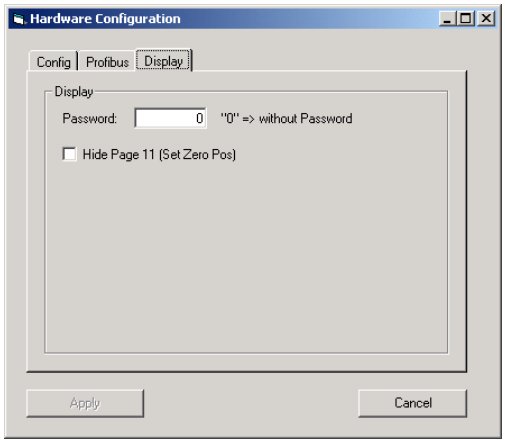
Input "Enable" is allocated to input No. 1: => Input: **I1.1**

Example 2:

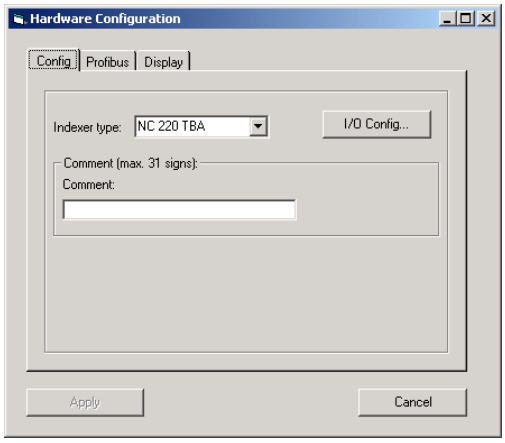
Input "Enable" is allocated to the first bit of the Profibus message: => Input: **Bit 1**



5. In the category "display" you can set a password protection for the display.



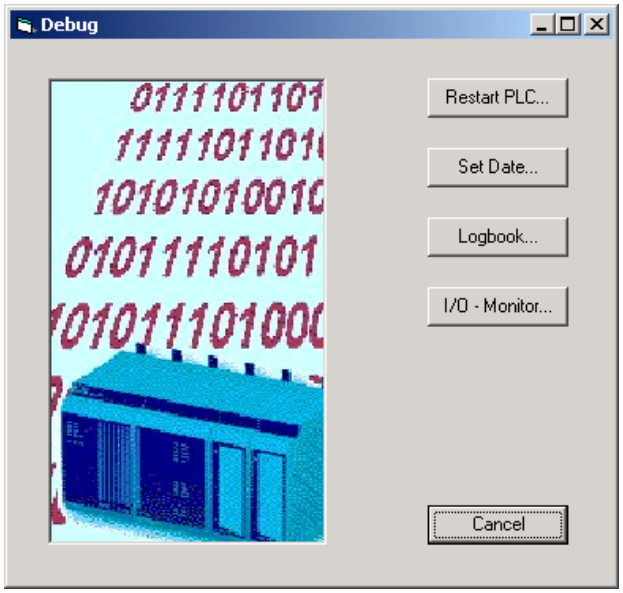
The input field "Set Zero Pos" on the display (picture No.11) which is used for the definition of the mechanical zero point, can fades out completely so that set zero is only possible via the Windwosprogramm.



6. The button "Apply" transfers the settings to the controller and stores them there. The controller has to be restarted to make the new setting effective.

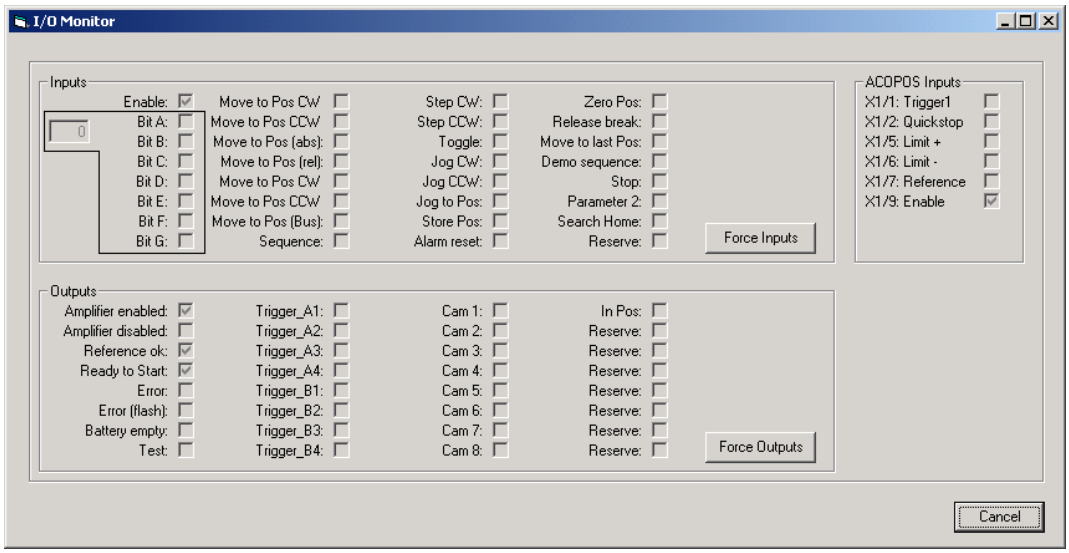
7.2.2 Debug

The functions "Restart PLC", "Set Date", "Logbook" and "I/O Monitor" are available under the menu item "Options->Debug“.



The button "Set Date..." is used to set the PLC time and date to the current PC date. The PLC date is used to attach a time stamp to each error message.

The button "I/O Monitor..." opens the I/O Monitor that displays the current states (HIGH/LOW) of the individual input and output bits. The inputs and outputs can also be “forced” for startup purposes.
The frame around the inputs Bit_A..Bit_G and the input field is intended to make the representation of these signals easier. The inputs Bit_A..Bit_G represent the numbers of the commands "Move_to_Pos" and "Sequence" in binary form. The input field can be used to specify these values in the familiar decimal system.

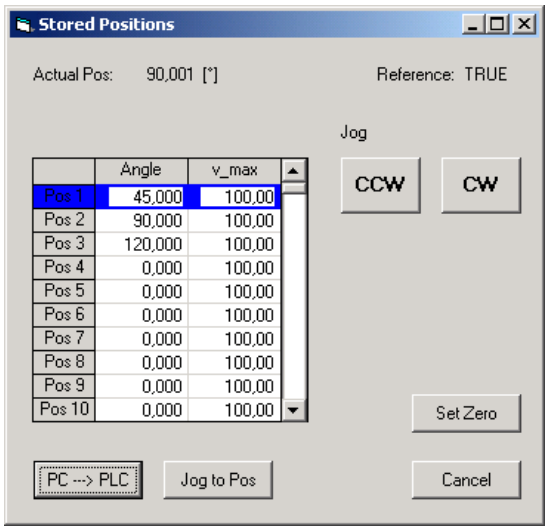


It is recommended to use the I/O Monitor during startup to control the wiring. If a bus system is used (e.g. Profibus), its function can be checked as well.

On the right side, the inputs of the ACOPOS drive are shown. They cannot be forced.

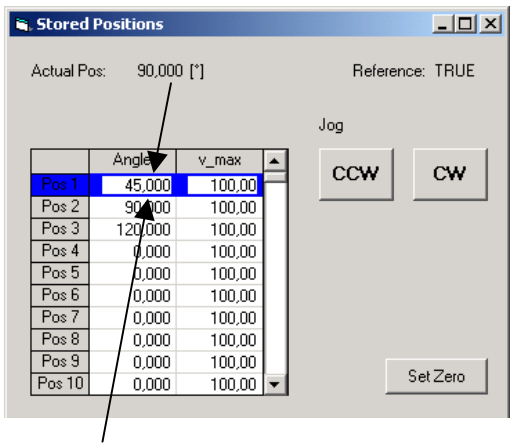
7.2.3 Teach Positions

After the hardware has been configured and the I/O interface has been tested with the I/O Monitor, the individual positions are teached.



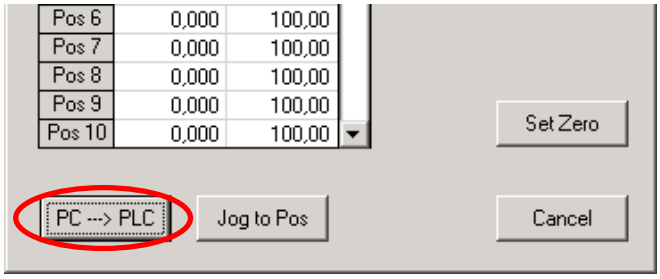
A total of 127 positions with the descriptions No.1...No.127 are available for teaching. The Position 0 has a special meaning: If Position 0 is called, a reference run is triggered. This function is ignored by systems with an absolute encoder (indexer types: NCxxxTBx).

Setting of the values:
The blue cursor is set to the position number that is to be teached. Thereafter, the axis is moved to the target position with the keys "CW" and "CCW" (jogging operation). The actual positions are accepted into the input field through a double-click when the blue cursor is at the column "Angle".



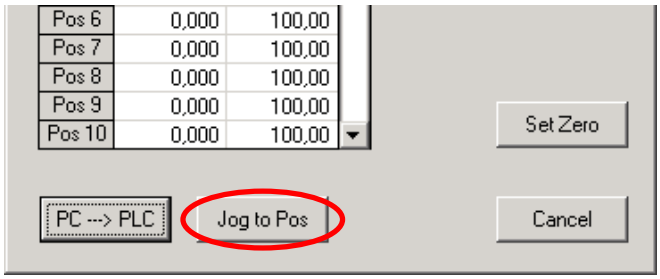
Double-clicking on one of these fields accepts the values of the actual position.

Alternatively, the position can be entered directly as numerical value (if known). It should be noted that the numerical input is only accepted after pressing RETURN. If the input field is left with TAB or a mouse click, the new input value is discarded.
For each individual position a v_max (0...100%) can be specified.



Once all values have been specified, they are transferred to and stored in the PLC by clicking the button "PC → PLC".

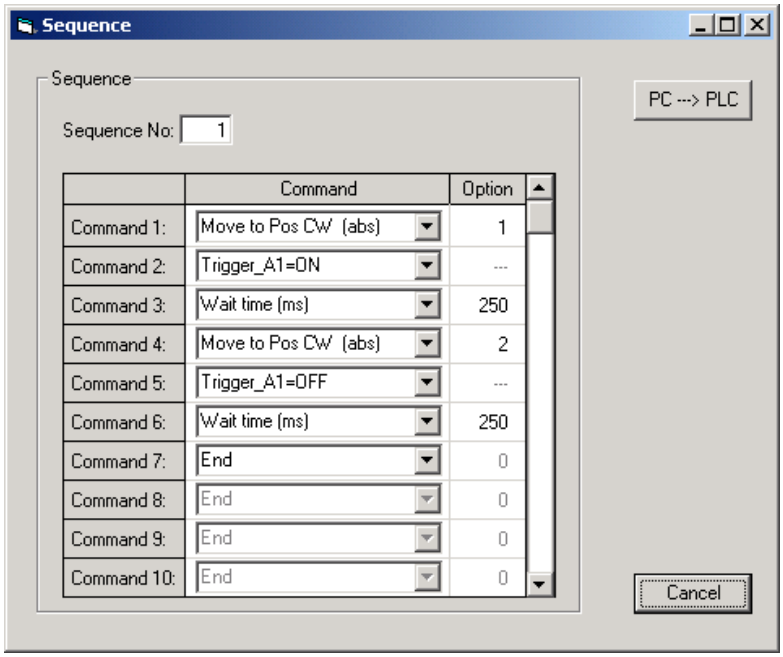
Alternatively, the individual positions can be teached through the customer interface.



The button "Jog to Pos" is used to move in jogging mode to the position No. currently marked by the blue cursor.

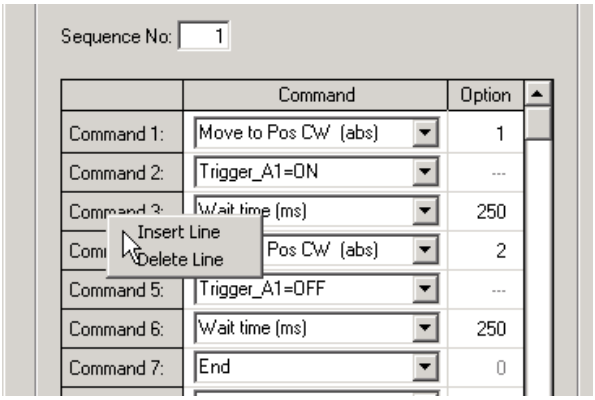
7.2.4 Adjust Sequences

At the menu entry “Program->Sequence...“ sequences can be stored. Sequences are started like movements to individual positions, but instead of the command “Move to Pos“ the command “Start Sequence“ is given. Up to 10 sequences can be stored. Each sequence can have a maximum of 40 commands.



1. Enter sequence No. (number between 1..10)
2. Specify commands 1..40. The commands are described below
3. Store sequence on the PLC (PC → PLC)

A right mouse click on the column "Commands xxx" opens a menu where lines can be inserted or deleted.

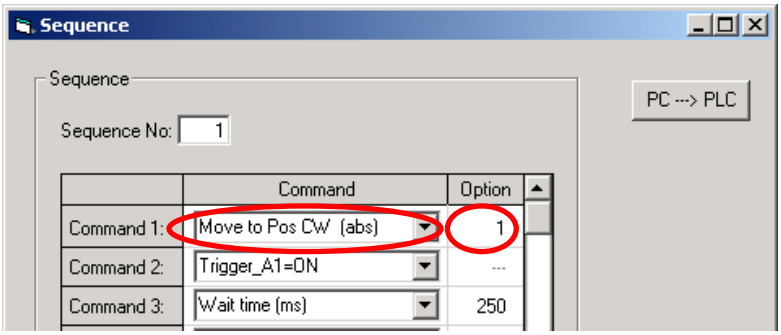


The following commands are available:

- Move to Pos CW (abs)
- Move to Pos CCW (abs)
- Move to Pos optim. (abs)
- Move to Pos (rel)
- Step CW
- Step CCW
- Wait time (ms)
- Trigger_A1=ON / OFF
- Trigger_A2=ON / OFF
- Trigger_A3=ON / OFF
- Trigger_A4=ON / OFF
- Trigger_B1=ON / OFF
- Trigger_B2=ON / OFF
- Trigger_B3=ON / OFF
- Trigger_B4=ON / OFF
- End

The commands in detail:

Move to Pos CW (abs)
The indexer moves to the teached position number xx with absolute coordinates. The rotation direction is right (CW). The position number is the value in the column "Option".



Move to Pos CCW (abs)
As above. The rotation direction is left (CCW).

Move to Pos optim. (abs)
As above. The rotation direction is selected to ensure that the axis moves the shortest way.

Move to Pos (rel)
As above, only the position is interpreted as relative position.

Step CW
The indexer performs one step, i.e. it moves to the next graduation position. Rotation direction is right (CW).

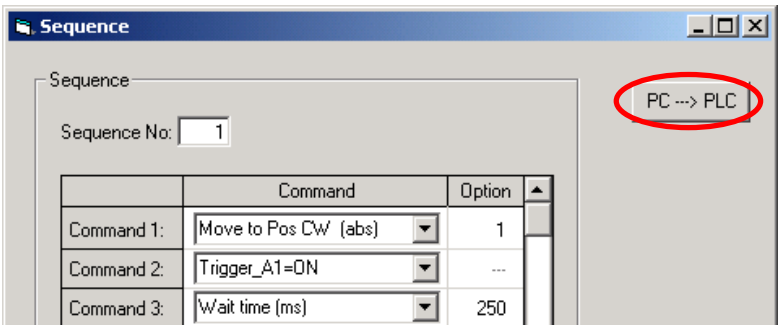
Step CW
As above. Direction of rotation is left (CCW)

Wait time
A waiting period is inserted. The numerical value in the column "Option" specifies the waiting time in milliseconds.

Trigger A/B ON/OFF
The respective trigger output is set/deleted.
Trigger outputs of the Group A are automatically set to LOW after completion (or termination through fault/Emergency-Stop). Triggers of Group B are retained.

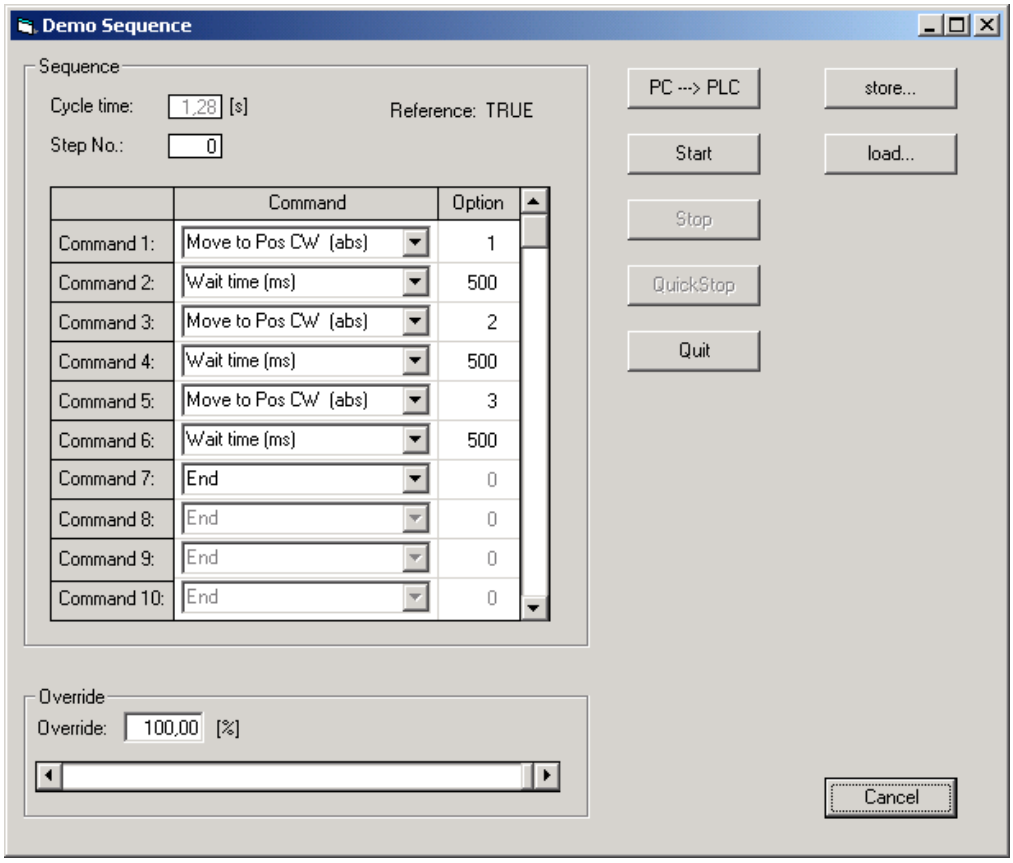
End
End of sequence.

Finally, do not forget to save the sequence on the PLC with the button "PC → PLC".



7.2.5 Demo Sequence

The demo sequence works similar to the normal sequence. Difference: At the end of the sequence the system jumps automatically to command 1. The demo sequence is used for presentations and for startup, to run-in the system.



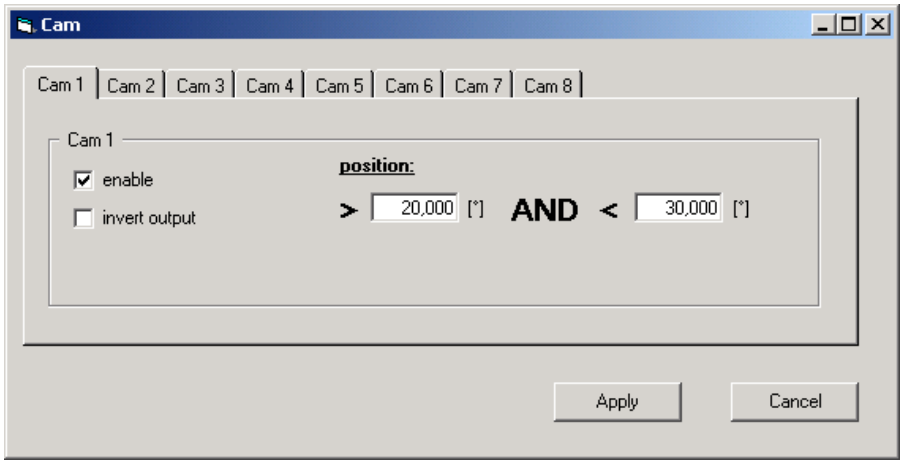
The fields in detail:

1. Cycle time: Movement time.
2. Step No.: Displays the currently active step.
3. "Override": Refers to the overall speed override, i.e. all speeds are multiplied with this factor (0.01%..100.00%).
4. "PC → PLC": Stores the demo sequence in the PLC.
5. "Start": Starts a demo sequence.
6. "Stop": The system stops after the last command.
7. "Quick Stop": The system stops immediately.
8. "Quit": Acknowledge fault.
9. "Store": The demo sequence is stored on the hard disk of the PC.
10. "Load": A demo sequence is loaded from the hard disk of the PC (It must then be stored with the button "PC → PLC")

Other dialog boxes under the menu entry: "Options":

7.2.7 Cams

Up to 8 software cams can be defined. The output is provided at the outputs Cam_1..Cam_8 (see HW_Config.../I/O_Config...)

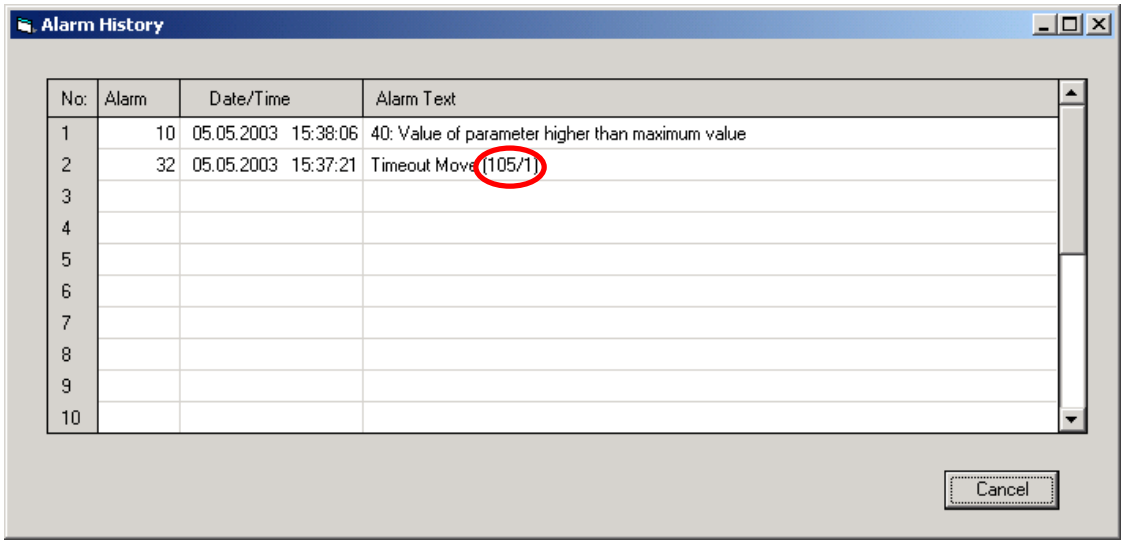


In the example above the output goes HIGH if the axis is in the range between 20.0°..30.0°.

The cams are always calculated even when the axis is moved in jogging operation or if the axis is disabled and the indexer is turned by hand.

7.2.8 Alarm History

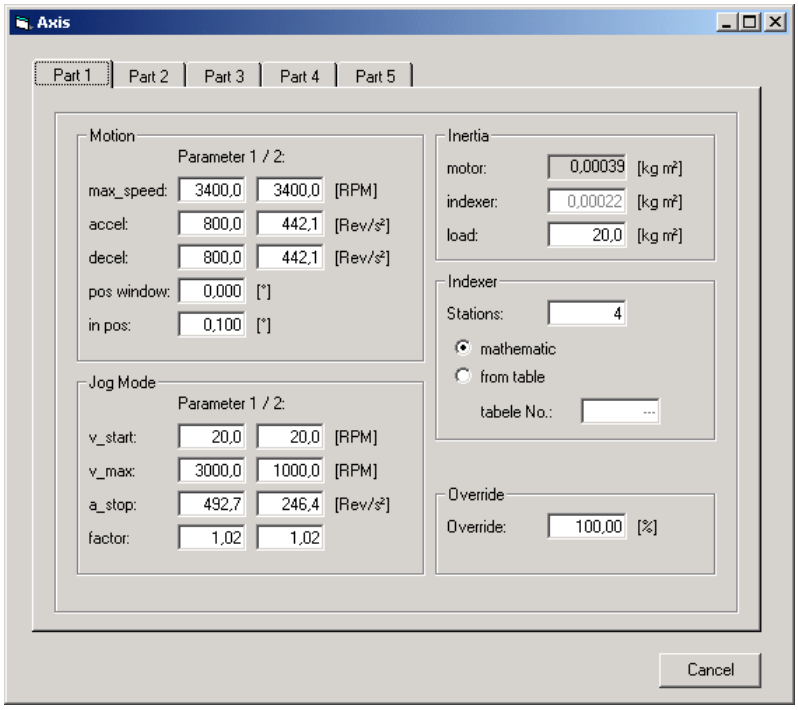
Up to 20 error messages can be displayed in the alarm history. If the PLC clock has been set, a time stamp is provided as well.



The values in brackets provide an accurate description of the error message. The WEISS Service evaluates this information.
Fault No. 10 concern error messages of the ACOPOS drive. The error number of the ACOPOS drive as well as plain text information are provided in the alarm text.

7.2.9 Axis

Important axis settings can be set under the menu entry "Options->Axis". Due to the large number of setting, the dialog box is split into five parts. For the customer, only part 1 is important.
In the menu "options->axis advanced" you'll find more settings. Some of this only enabelt for WEISS service technicians.



Group Motion:
The parameters for normal movement are specified here, e.g. the speed and start/stop ramps.

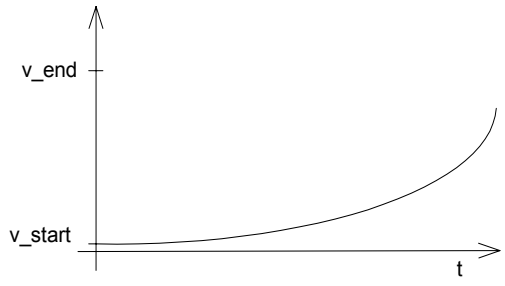
max_speed:	The maximum rotation speed of the motor axis is defined.
accel:	Start ramp (relating to the motor shaft)
decel:	Stop ramp. Usually equal to the start ramp.
pos. window:	The position window influences the time of the completion message, not the accuracy! If the position window is > 0.000° the completion message is generated as soon as the axis is within the position window. However, the axis still completes its movement. This function has the purpose of compensating for delays (ACOPOS drive -> PLC -> customer PLC).
in pos:	Size (length) of the software cam "InPos" => See description of Output "InPos"

The settings for max_speed, accel and decel are predefined when the indexer type and the inertia are set. The limits for these inputs are provided by the Group "Limits" in part 2 of the dialog box.

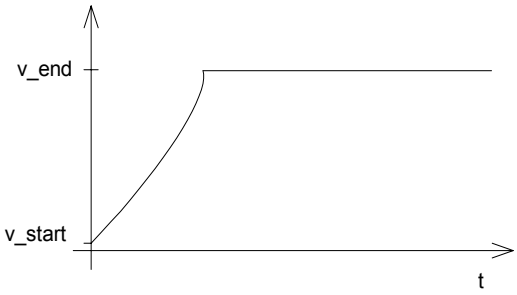
The input fields for the parameter sets 1 and 2 are shown. Switching between those sets is achieved through a digital input.

Group Jog Mode:

v_start: Starting rotation speed for jogging operation
v_max: Max. rotation speed for jogging operation
a_stop: Stop-ramp for ending of jogging operation
factor: Factor determining the speed of change from rotation speed v_start to v_max.



small factor (1.01)



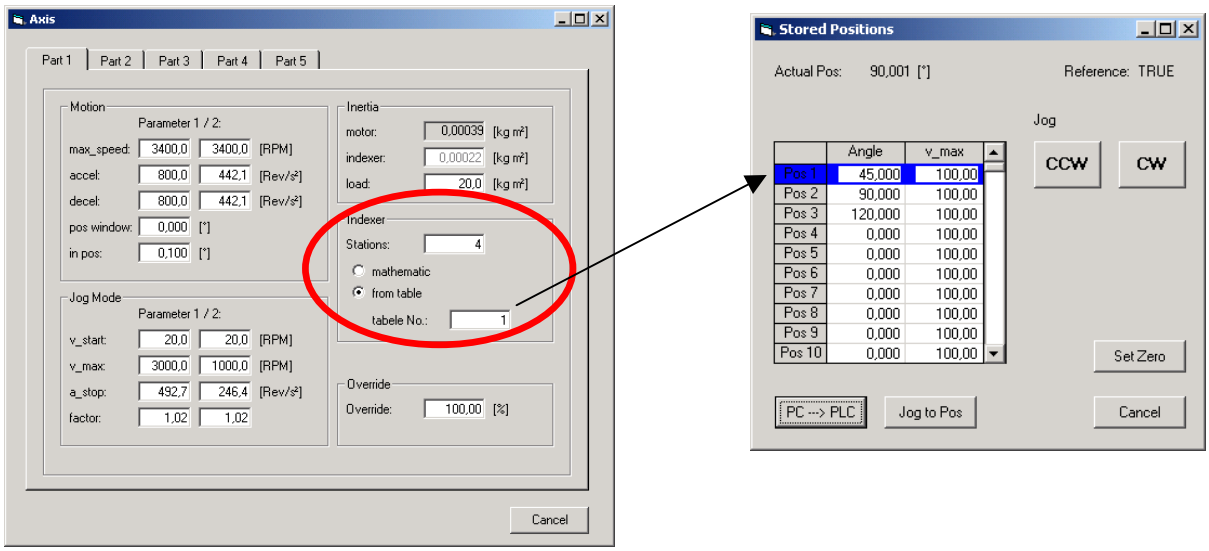
large factor (2.0)

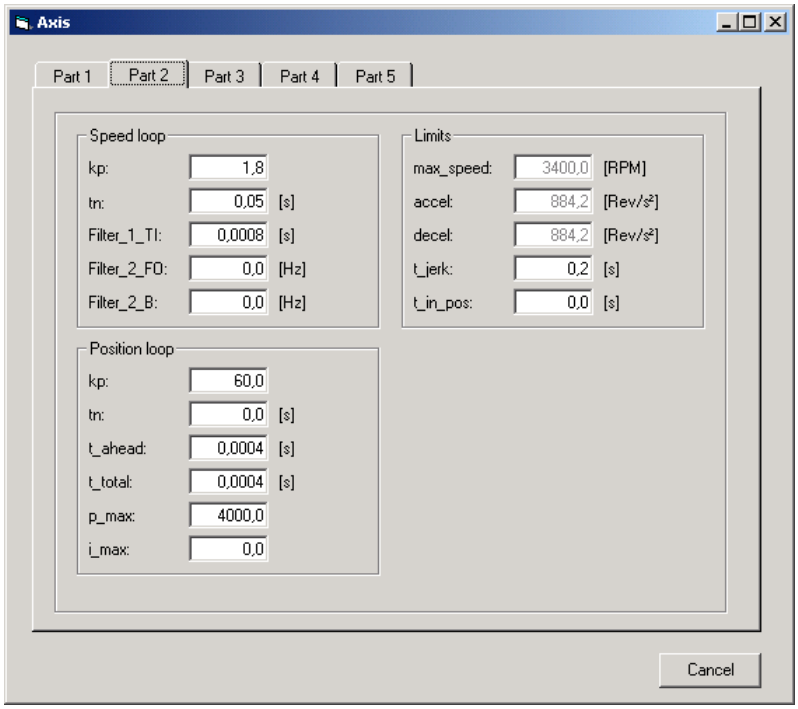
Group Inertia:
The mass inertia of the indexer as well as the inertia of the customer load are set. The inertia of the indexer is set automatically when the definition of the indexer type is provided.
An input causes recalculating of the start- and stop ramps in the motion- and jog parameters as soon as at the limit values.

Group Override:
The general override (speed override factor for all movements) can be entered here. The input field is identical to the input field “override” of the dialog box "Demo Sequence".

Group Indexer:
If a indexer with fixed graduation is used, the graduation is set here. The graduation applies for the commands "Step CW" and Step "CCW". Values between 2..1500 can be entered.
There are two possibilities to specify a graduation:
- Calculate graduation mathematically: The positions are spread symmetrically, i.e. the axis moves about:
s = 360.0° / stations (e. g. 0.0° / 90.0° / 180.0° / 270.0°)
The inputs Bit_A..Bit_G defines an position offset, taken from the table “stored position”. Also the speed override defined in the table is used.
Normally these inputs are LOW. They are used in case of an product alternation.

Teach stations: The positions are taken from the table “Stored Positions“. Example: You have 4 stations, with 4 nests (offset: 10°).
Now the axis move with each “step“ command to the following positions:
0.0° / 10.0° / 20.0° / 30.0° => station 1, nest 1...4
90.0° / 100.0° / 110.0° / 120.0° => station 2, nest 1...4
180.0° / 190.0° / 200.0° / 210.0° => station 3, nest 1...4
270.0° / 280.0° / 290.0° / 300.0° => station 4, nest 1...4
You must preset 16 stations (4 station x 4 nests each station)
You can set the counter for the next position number with the command “Move to Pos xxx” e.g. after Power ON or after hand mode. With reference search or “set zero” the counter is set to the first position.
With the inputs Bit_A..Bit_G the initial position is shifted (here the number build from Bit_A..Bit_G is added to the value “1”).

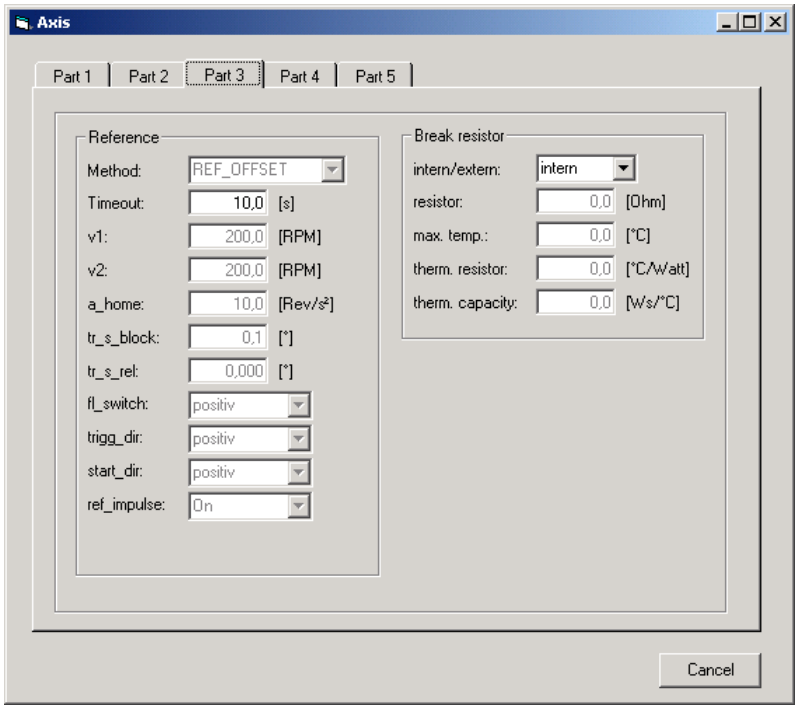




Group Speed loop:
Settings for the rotation speed controller. These settings are only relevant for a WEISS technician.

Group Position loop:
Settings for the position controller. These settings are only relevant for a WEISS technician.

Group Limits:
Max_speed, accel and decel are defined by the indexer type and the mass inertia and cannot be changed.
t_jerk changes the movement profile. A t_jerk of 0.0 s means very hard movements. A t_jerk of 0.2 s means very gentle movements, but longer movement times.
t_in_pos delays the completion message by the set time (settling time).

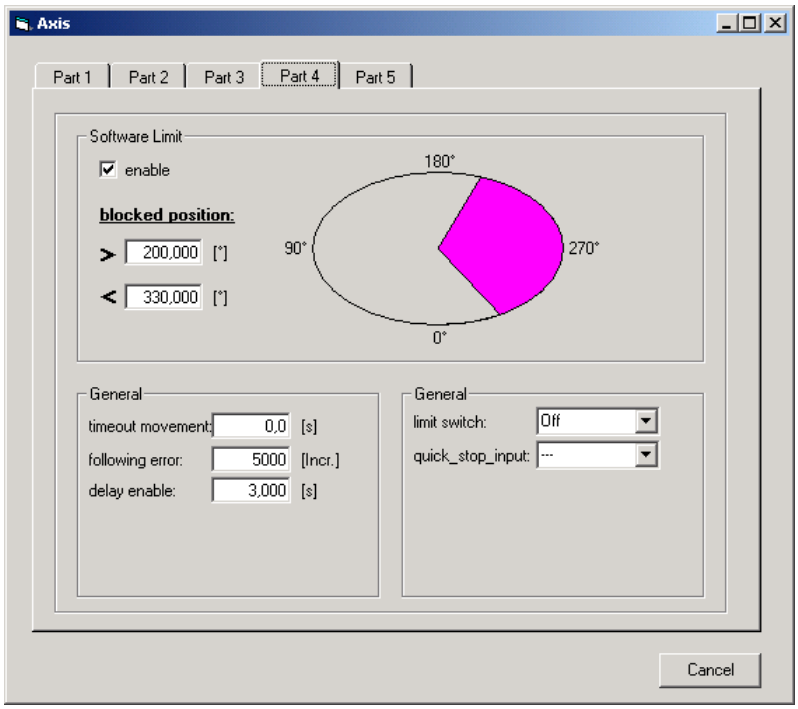


Group Reference:
A reference run has to be performed for indexers without an absolute encoder. This is not relevant for the indexer types NCxxxTBx as they use an absolute encoder.

Group Brake Resistor:

internal/external:	Switches between internal and external brake resistor. If the internal brake resistor is selected, the subsequent settings are irrelevant. Switching is only possible if the motor is disabled.
resistor:	Resistance value of the external brake resistor.
max. temp:	The external resistor is monitored through a temperature model. The value for the max. temperature is the threshold at which the resistor is switched off.
therm. resistor:	Thermal resistance value of the external resistor (manufacturer information)
therm. capacity:	Thermal capacity of the external resistor (manufacturer information)

The ACOPOS drive for the indexer types NCxxx (ACOPOS1022 / 1045 / 1090) have an sufficiently sized internal brake resistor, so that this function is not significance.



Group General:

timeout movement: Fixed setting of the movement timeout for all motor movements. If a value of 0.0s is entered, the timeout is calculated individually (depending on the rotation angle, speed, etc.).

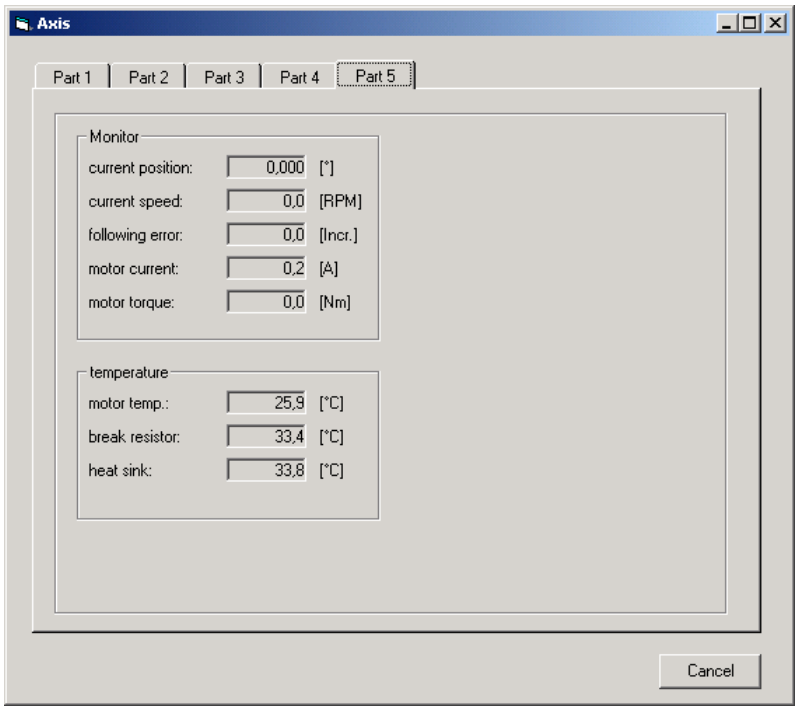
following error: In addition to the movement timeout, the rotating movement can be monitored through the following error.

delay enable: The enable of the axis with clamp X1/9 (at the ACOPOS drive) will be delayed in order to guarantee that the mains voltage is correctly on and the DC bus in the ACOPOS drive is ready. Otherwise you can get an alarm message (DC bus voltage too low / slash unstably). This delay time depends on the hardware wiring as soon as of the model of the drive.

limit switch: If hardware-limit are used, they can be activated here. Opening-type switches have to be used.

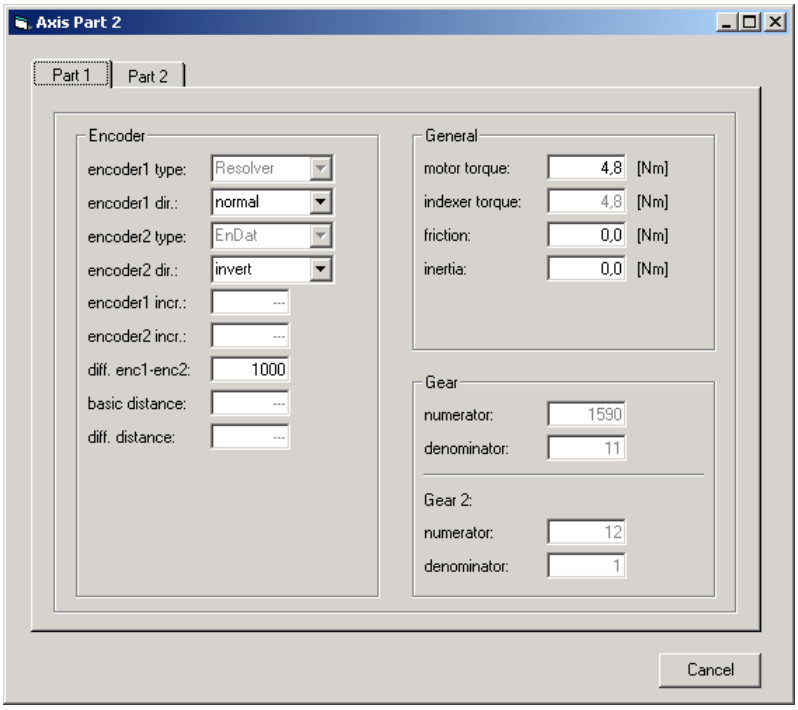
quick_stop_input: Defines the function of the input X1/2 on the ACOPOS:
- No function
- Quick_stop LO-active
- Quick_stop HI-active

If this input is active, all movements are stopped. As this is achieved through the ACOPOS operating system, this input is on its own not sufficient to ensure a sufficient EMERGENCY-Stop functionality.



The values in Part 5 are only display values.
Of special interest are the motor temperature and the temperature of the brake resistor.

Dialog box: "axis advanced" – part 1



Group General:

motor torque: Maximum peak torque of the motor.
A limit of the peak torque reduce not reduce the effects appreciably in the case of a crash! It has the disadvantage that the indexer becomes slower (you have low acceleration torque).
Reason:
1. Crash in full movement: The rotational plate (with the gigantic MTM) has the most energy. The motor energy is small.
Also the stop ramp becomes longer, so that the opposite occurs => longer brake distance
2. The indexing table has a great ratio of reduction (e.g.: 1: 190). If we reduce the allowed torque momentum e.g. from 100Nm on to 20Nm we have up 3800Nm (190 * 20) at the output shaft. The indexing times slowed down strongly. If you reduce more the torque the indexer gets stuck in friction.

To reduce the effects of a crash, the following steps are helpful:
- Reduce the limit for following error. Consequently, a crash becomes are early detected.
- Reduce maximum speed. As a result, the energy in motion is reduced strongly. The influence on indexing time is smaller than a reduction of the start stop ramp.

indexer torque: Max. permitted torque of the gearbox (motor side).

Group Encoder:

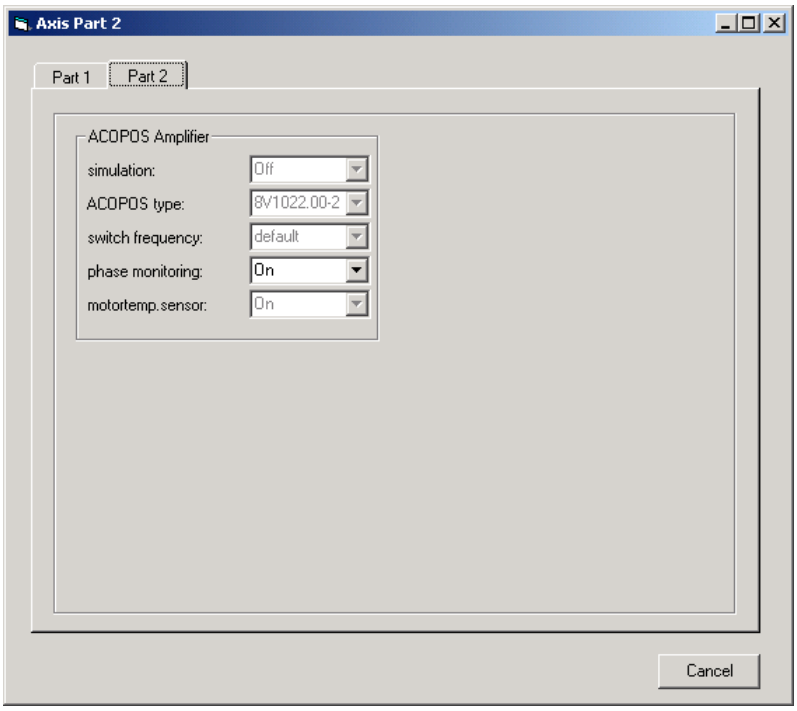
Setting of encoder type and direction.
These settings are configured automatically by definition of an indexer type in dialog box "hw_config"
The customer can change only the direction. Normally it is set that you got increased position values if the indexer turns in right direction.

Diff. Enc1-Enc2: Maximum difference between encoder 1 (motor encoder) and encoder 2 (encoder at gear). The difference between these two encoders are monitored. If the limit is exceed (belt or coupling broken e.g.) the system will generate an alarm. So this value must be lager then the elasticity of the mechanic.

Group Gear:

The gear ratio will be automatic set when you select an indexer type (dialog box "hw_config").

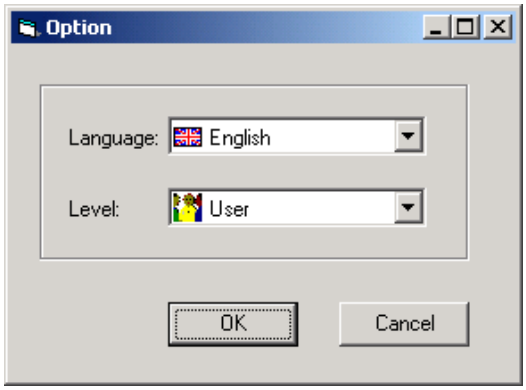
Dialog box: "axis advanced" – part 2



Simulation: The drive can be switched into a simulation mode, so that it can be operated without motor (only possible if the second encoder is disabelt).

Phase monitoring: The drive monitors all three main lines (L1,L2,L3). You can disable this monitoring. Default is on!

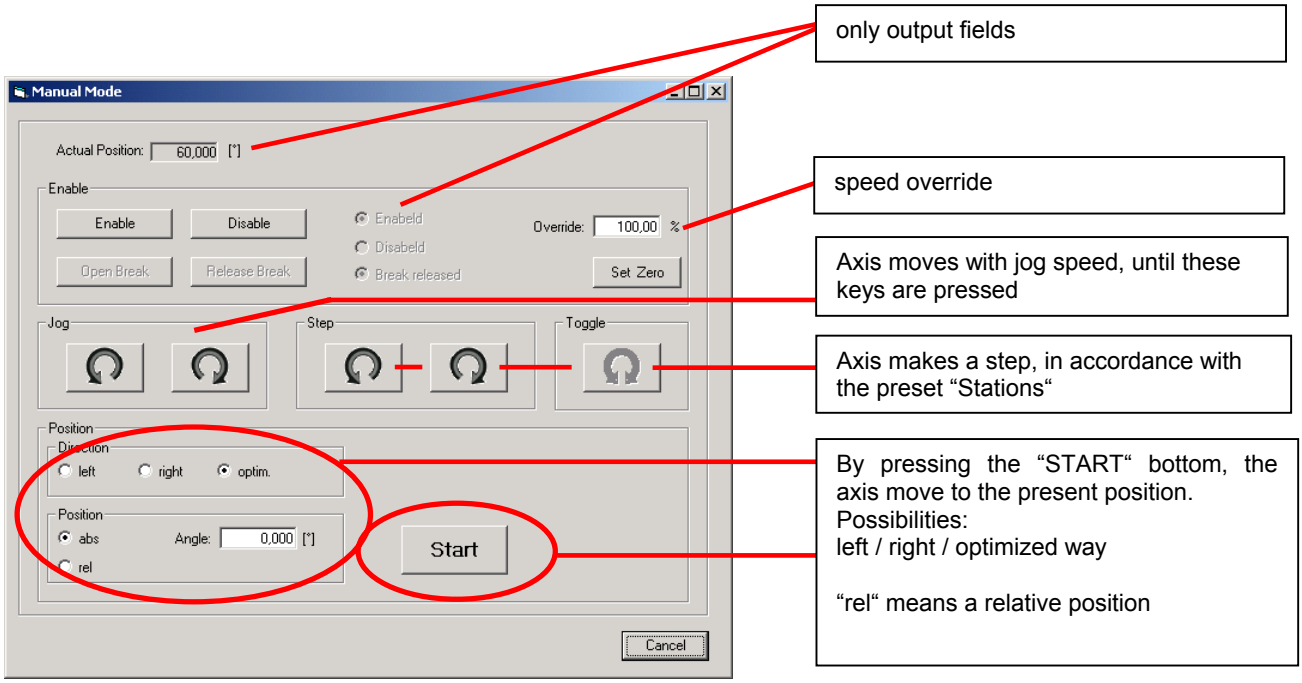
7.2.10 Options



The language of the Windows Program can be set. The following languages are available:

- English
- German
- French
- Italian
- Spanish (in preparation)
- Dutch (in preparation)

7.2.11 Manual Mode



In the dialog box "manual mode", some important control elements are summarized for manual operation.

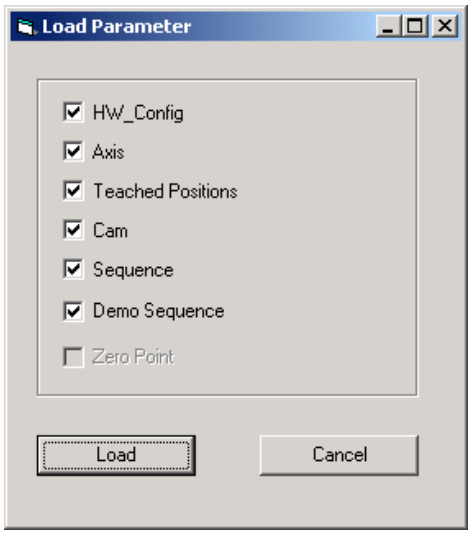
Other dialog boxes under the menu entry "File":

7.2.12 Store Parameters

This menu item is used to read all data from the ACOPOS drive and to store them on the hard disk in a file similar to a *.ini file. This has the following purpose:
- The customer can save/document the delivery status of the machine.
- Support for problems. If problems occur during startup, it is useful the send the generated parameter file through E-mail to a service technician of WEISS. He will check your file and recommend any modifications/changes. The file can have up to approx. 2000 values!
- Data for the case, that the drive is defect and must be exchanged.

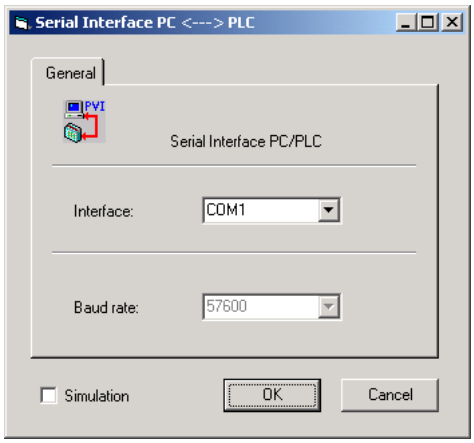
Store the parameter file and keep well. Add a copy of the parameter file during delivery.

7.2.13 Load Parameters



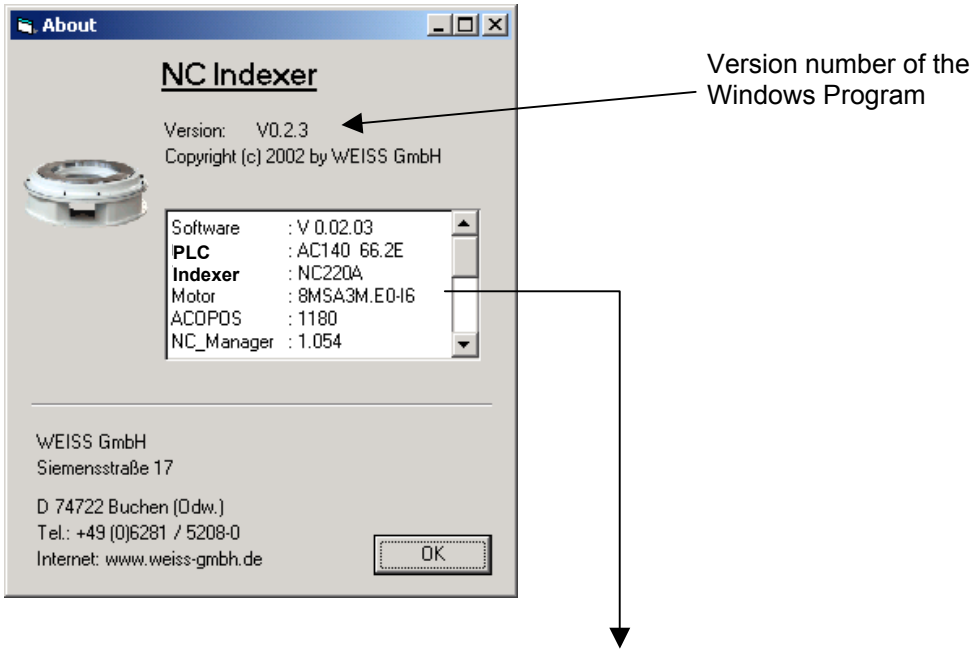
When stored values are loaded, it is possible to select which groups will be loaded.

7.2.14 Connection



It is important to define the serial interface used on the PC (COM1...COM8). The baud rate is set permanently to 57600. It has to correspond with the baud rate of the PLC.

7.2.15 Info dialog box

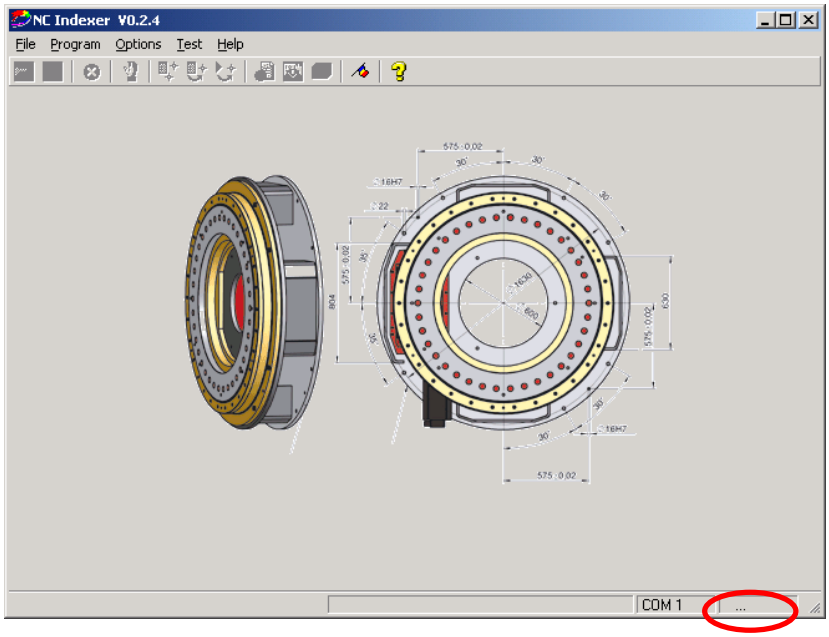


Detailed information concerning the connected hardware as well as the operating system of the PLC and the ACOPOS drive is provided.

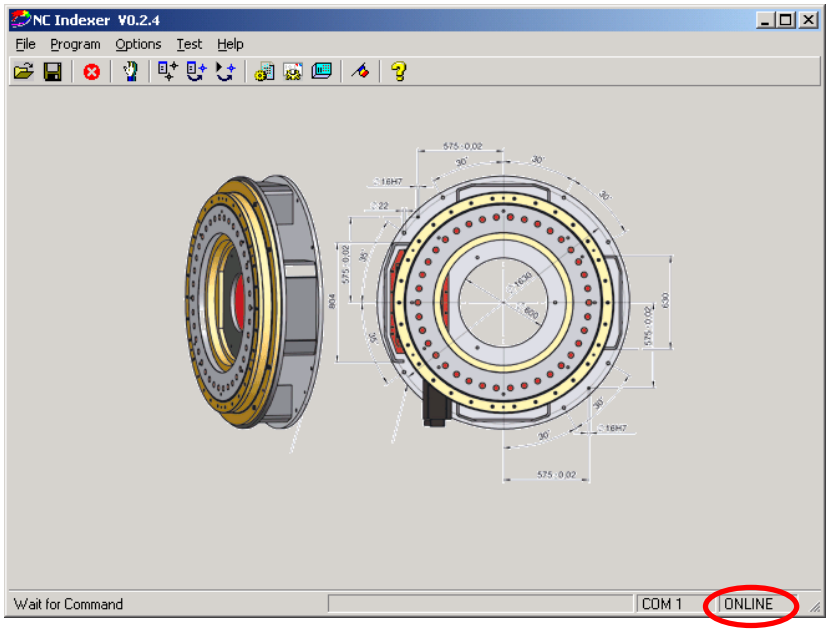
8. Program example

Detailed program example
This chapter provides a detailed program example. The example uses a controller with digital I/Os. The Profibus version works similar.

Procedure:
1.) Hardware configuration:
Supply device with 24V. Establish PC->PLC connection.

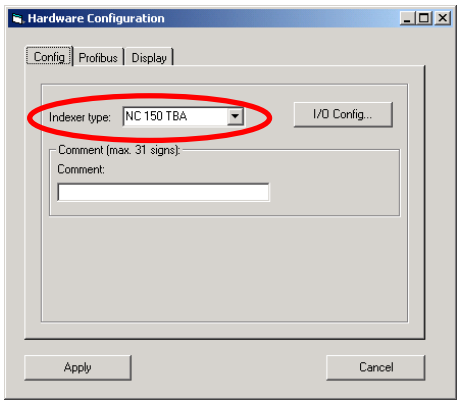


The PLC was recognised at the interface COM 1, the connection is established.

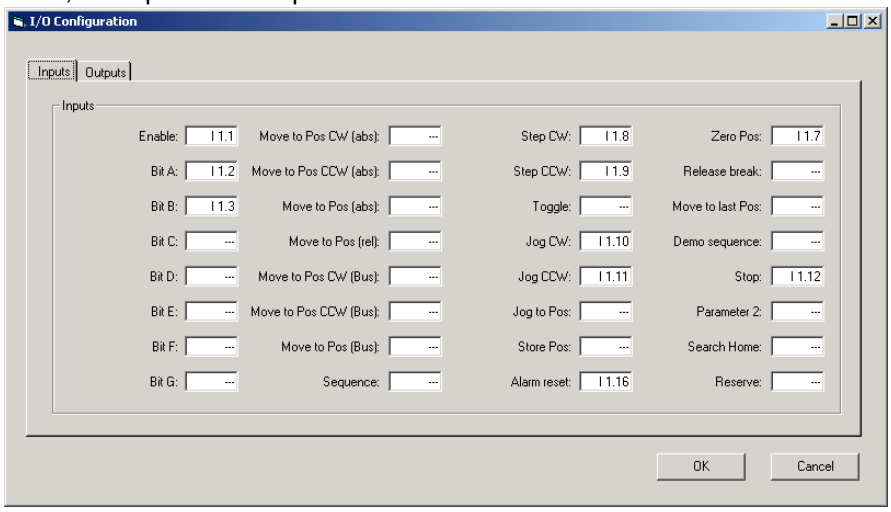


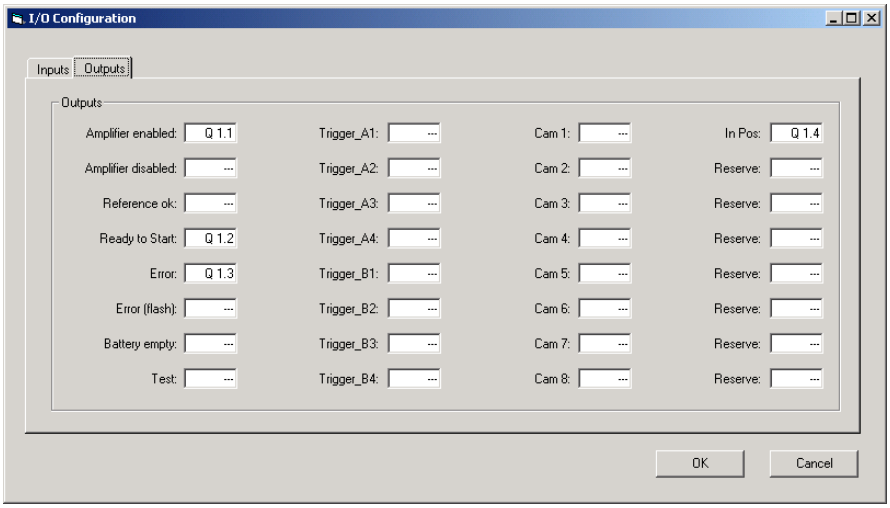
The connection PC <-> PLC was established. The system can be addressed through the Windows Program.

First, the type of the connected indexer has to be entered.



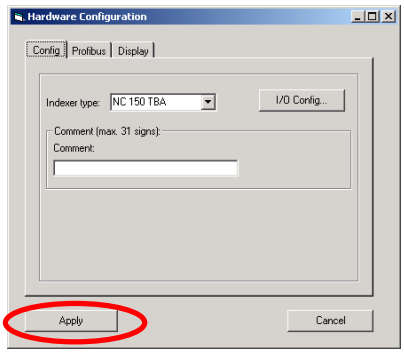
Then, the inputs and outputs are allocated.





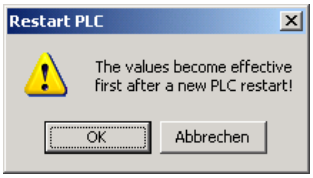
Input I1.1:	Software enable: This input must be HIGH, otherwise no movement is possible
Input I1.2, E1.3:	Pointer to table "teached position"
Input I1.8, E1.9:	Start indexing (left/right) with rising edge
Input I1.10, E1.11:	Move indexer in jog mode (if input is HIGH)
Input I1.12:	Stop Input to interrupt movements
Input I1.16:	Reset alarm
Input I1.7:	Set zero pos (with rising edge)
Output Q1.1:	Feed back: axis enabelt
Output Q1.2:	Ready to Start => most important handshake signal. Shows you that the old command is finished and a new command will be accept
Output Q1.3:	Alarm message
Output Q1.4:	Additional position windows: "InPos"

This configuration is then stored in the PLC.



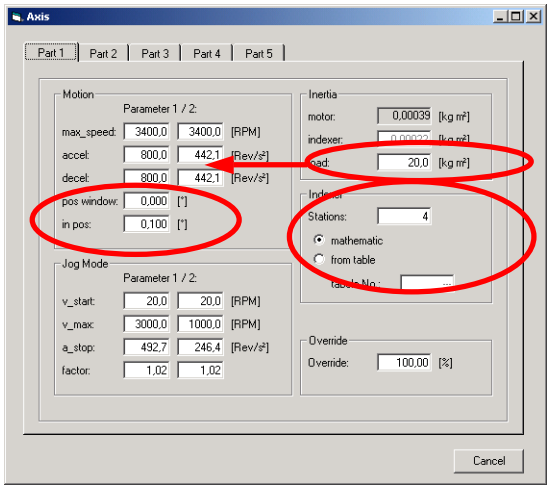
The button "Apply" stores all the information in the PLC.

The following question appears:



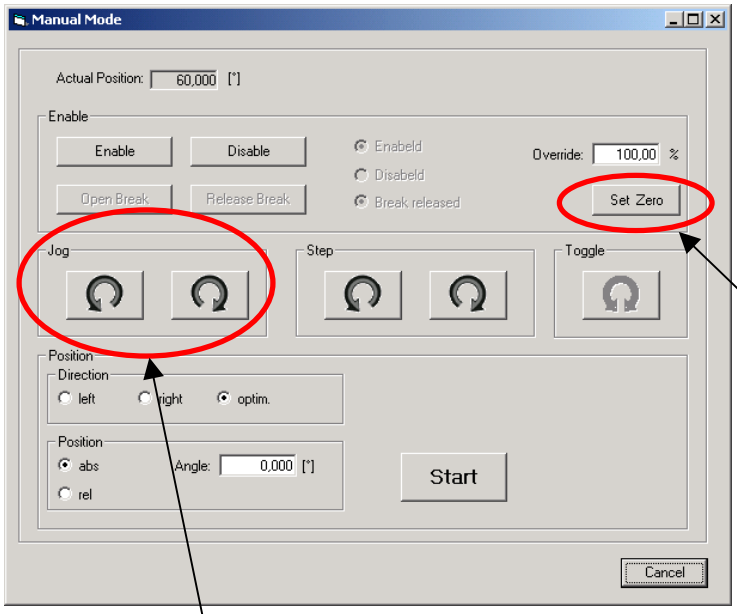
After a restart the changed configuration is active.

2.) Settings in dialog box Options->Axis



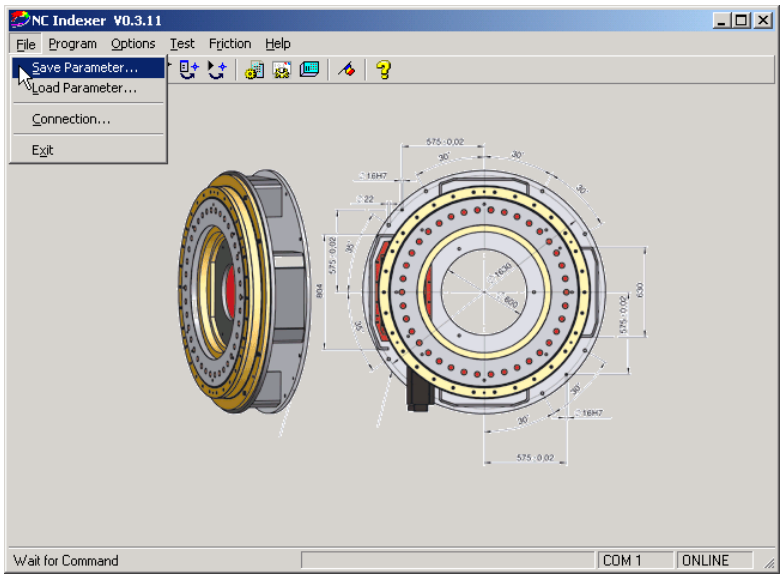
- With the specification of the load mass inertia the maximum acceleration will be calculated new.
- Specify the number of steps. E.g. 4 steps per round => you'll got the angle: 0.0°, 90.0°, 180.0°, 270.0°
- Specify "pos window" = 0.000° => defines the end of the move command => Output "Read to Start".
- Specify "in pos" = 0.1°
  A second position window will be calculated who comes earlier (Output: "InPos Q1.4)
  The output "Ready to Start" means not automatically that the position is reached.
  The movement also can be interrupt by E-Stop or interrupt by an alarm.

3.) Define zero position



Use the jog buttons "CW" and "CCW" to move the indexer to zero position. Then apply the zero position by pressing the button "Set Zero". The display of the actual position changes to 0.000°.

Now the indexing table is ready to work.
By using the input I1.8 "Step CW" the indexer makes step by step (0.0°, 90.0°, 180.0°, 270.0°)

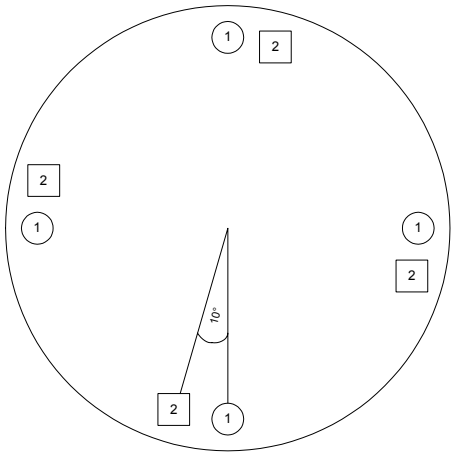


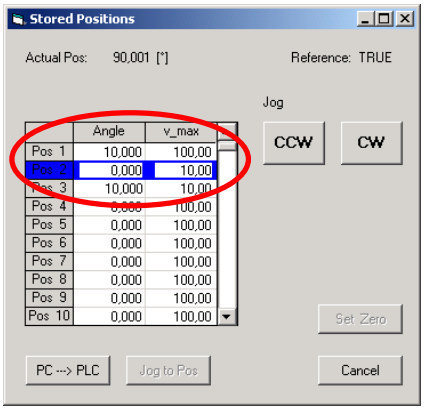
These settings are now saved in the parameter file.

Store the parameter file and keep well. Add a copy of the parameter file during delivery.

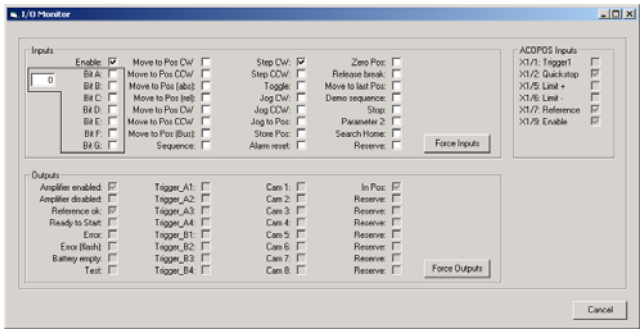
4.) Product change

Extension of the task:
You have an indexer with 4 positions and you need to handle two products. The mounts between product 1 and product 2 are displaced around 10.0 °

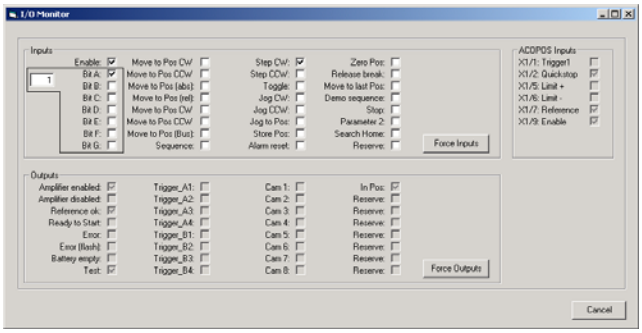




Insert in the dialog box "Stored Positions" the offset between the two products (e.g. 10.0°). Also the speed 100% for the second product.



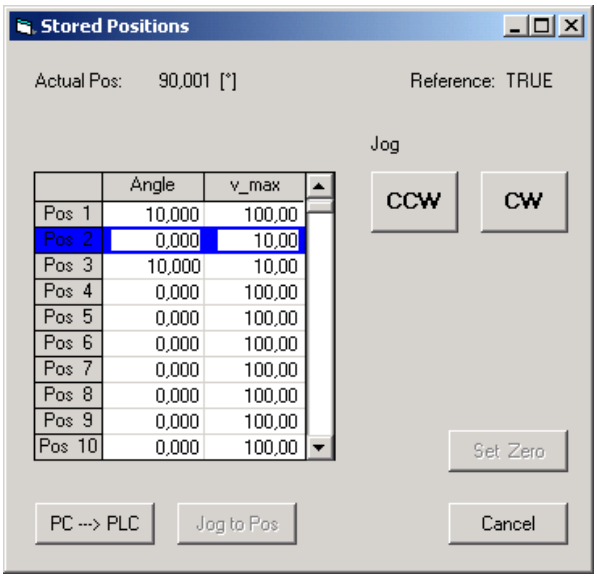
Commands product 1: **Bit_A = 0**
0.0°, 90.0°, 180,0°, 270.0°



Commands product 2: **Bit_A = 1**
10.0°, 100.0°, 190.0°, 280.0°

5.) fast / slow speed

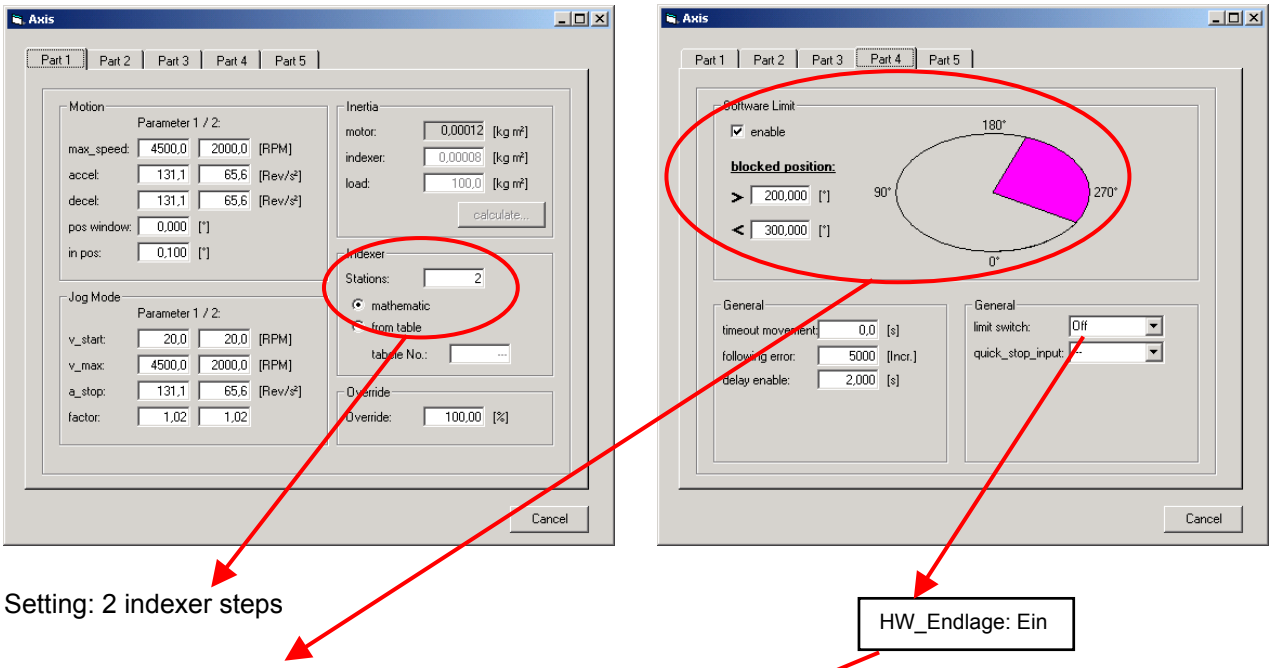
Now switch between fast and slow speed:



Commands:

Command	Bit_B	Bit_A
fast step, product A	0	0
fast step, product B	0	1
slow step, product A	1	0
slow step, product B	1	1

Example 2: Indexer with two stations (no endless rotation allowed)

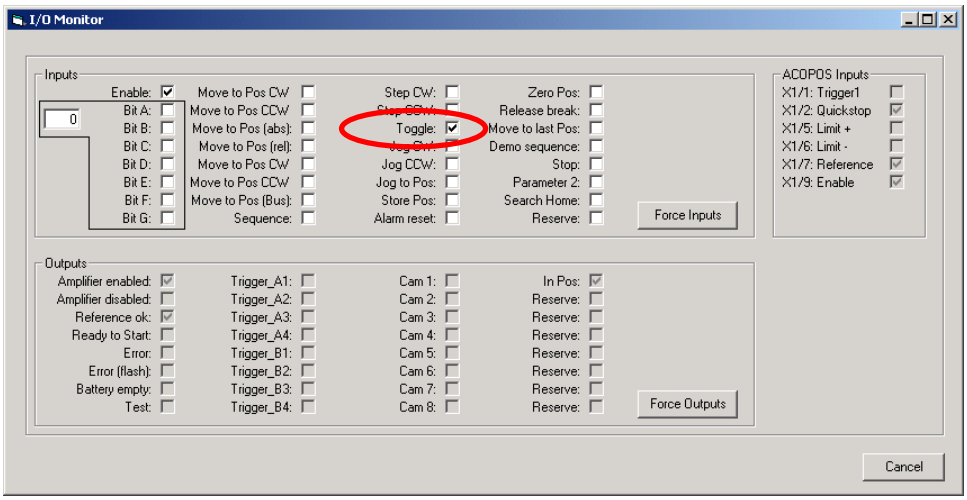


Setting: 2 indexer steps

HW_Endlage: Ein

Setting: Software limit switch: blocked area: 200.0° … 300.0°

Additional hardware limit switches can be mounted.



With rising edge at input "toggle" you'll make alternate steps between 0.0° and 180.0°.
If a command will be interrupted (E-Stop or alarm) the movement will be continued with a new toggle command. This means the direction will be changed only if the final position (0.0° or 180.0°) is reached.

9. Error Codes and Troubleshooting

9.1 Error Codes

When an error occurs, the output "Error" is set.
In the Windows Program the error number and a clear text message are displayed. In addition, two more parameters that may be useful for error finding, are shown in brackets:
- Parameter 1: Program position (Step No.) in the PLC program
- Parameter 2: Additional information (e.g. error message of the drive)

9.2 Error messages

No.	Text	Description
1	Init axis	Fault during initialisation. Possible reasons: - CAN connection to ACOPOS drive faulty - 24V control voltage to ACOPOS drive not present
2	Timeout network init	A fault occurred during the initialisation phase 1 (network init): - DIP switch must be “0” “A” at AC140 - CAN connection to ACOPOS drive faulty - 24V control voltage to ACOPOS drive not present
3	Timeout network	Fault message of the network connection (CAN Bus) during operation
4	Timeout network	Fault message of the network connection (CAN Bus) during operation
5	Timeout network	Fault message of the network connection (CAN Bus) during operation
7	No Indexer	No indexer selected
8	CAN I/O missing	CAN Module (CX408) missing (no connection)
9	Zero position lost	Checksum Battery RAM after PowerON wrong
10	ACOPOS	Fault message of the ACOPOS drive. The fault number provided by the drive as well as a clear text message are part of the fault message.
12	ncaction() command	ncaction() command failed
13	ncaction() command	ncaction() command failed
14	ncaction() command	ncaction() command failed
15	second encoder	Second encoder not found
16	write EnDat	Timeout write EnDat
17	read EnDat	Timeout read EnDat
18	ncaction() command	ncaction() command failed
19	ncaction() command	ncaction() command failed
30	Invalid position No.	It was attempted to move to a position that does not exist (PosNo. < 1 or > 127). The 2nd parameter in the Windows Program indicates the faulty position number.
31	Position No. xxx not teached	It was attempted to move to a position that had not been taught. The 2nd parameter in the Windows Program indicates the faulty position number.
32	Timeout move	The movement was not competed in the calculated timeout period. Possible reasons: - Shaft does not move easily - Shaft blocked
33	Invalid sequence No.	Only sequences with the numbers 1..10 are valid
34	Fault in sequence	Invalid command in the called sequence
35	Preset value Profibus	The set value for target position is outside the limits
36	Preset value Profibus	The set value for target speed is outside the limits
38	Store position	Position could not be stored
40	Fault in movement sequence	Movement sequence does not contain any commands (empty sequence)
41	Fault in movement sequence	Movement sequence contains invalid commands
45	No Indexer	No indexer selected
46	Command not accepted	Command not accepted (software limit)
47	Toggle command	Toggle command not accepted (only possible by two steps)
50	Timeout Input	Timeout wait for input clamp X1/1

Fault messages of the ACOPOS drive:
When the fault number is 10, the alarm list provides more accurate information concerning the cause of the fault of the ACOPOS drive. You'll find a file with the description of the ACOPOS error codes at the CD-ROM in path: "Docu\BrAutomation\ErrorCodes".

9.3 Resetting Error Messages

There are two ways of resetting a error message:
- Set Input "Quit Error" to high for a short time (>20 ms)
- Reset the error through the Windows Program

9.4 List of the most frequent error reports

Error	Reason / Help
First-initiation: -Motor did not move -makes a small flip -hot after some attempts -Alarm: IGBT-Temperature,... -Alarm: Following Error,...	Motor line U/V/W connected wrong U: blue V: brown W: black
First-initiation: - Wrong indexing type defined.	If you did not know the correct indexer model (chapter 3.2) call WEISS. We need then the serial number. A wrong indexer model (hw_config) did not damage the hardware!
First-initiation: - Alarm: I/O CX408 not found - Display did not work	2 Possibilities: - Jumper at CX408 module for line termination resistor are not wired - CAN adapter (with double side DSUB) defect / internal wrong wired
First-initiation: Axis are disabelt. Enable not possible.	Open dialog box "I/O Monitor". Watch inputs: "Software Enable" and "Enable" at ACOPOS clamp X1/9. - Sometimes the customer forget wiring clamp X1/10 and X1/3 at ACOPOS. These clamps must connected to GND. The inputs X1/2 "Quickstop" and X1/9 "Enable" are galvanic isolated. So you need a separate GND wiring.
Alarm 8: "CAN I/O (CX408) missing"	You defined digital input/outputs (e.g. I1.1; Q1.4) in dialog box "I/O_config) and no CX408 is wired. - If you use Profibus change the I/O_config to e.g. "Bit 1"; "Bit 4"
If you disconnect the display from CAN bus, the motor will interrupt and you got the alarm: "CAN I/O (CX408) missing"	CAN bus between drive and I/O module did not work correct. Jumper for line termination at CX408 module are not wired.
Sporadic alarm: Motor, Encoder,....	Pin in motor plug are moved back. If the round motor plugs are not mounted correct, the pins inside the plug are moved back. => Switch of main power and check motor plugs (encoder plug)
Sporadic Encoder Alarm,...	If the motor and encoder line is much too long and you make a "coil" you'll got problems.
Alarm: Two encoder control: Stop limit of positions difference exceeded	The two encoder control detects a big difference between encoder 1 and encoder 2. - Check if you defined the correct indexer type (in hw_config) - Check belt - Check the coupling of second encoder. Be careful with the coupling of the second encoder! She bursts fast apart. After unmounting the coupling you have to check the zero position of the indexer again!
Alarm 2 : "Timeout network init"	The right DIP-switch at the AC140 slot PLC must be "0" "A". Perhaps this DIP-switch was mixed with the left DIP-switch for Profibus address.

10. Transport and Installation

10.1 Transport

WARNING

Please transport the indexer only with lifting equipment that is suited for the respective weight (see following weight table).
To fasten the indexer to the lifting tools, use eye bolts that can safely withstand the load according to the following weight table.

Weights of the indexers:

Type	Weight [kg]
NC 150	25
NC 220	38
NC 320	120
NC 500	270

10.2 Installation

Flatness of the support surface
The flatness of the machine frame has direct implications on the concentricity and axial run-out tolerances of the indexing ring.

Installation position
Installation of the NC types indexer in any position possible.

11. Spare parts

11.1 Spare parts

A list of replacement parts of the delivered model of the indexing table is attached as appendix to the delivery documents. The list is also attached to the operating instructions.
To prevent misunderstandings in connection with the order of spare parts, please include always the following data in your spare parts order:

- ❒ Item number according to WEISS name plate on the indexing table
- ❒ Order number of the spare part according to the list of spare parts
- ❒ Number of parts

Please send your spare parts order to:

WEISS GmbH
Sondermaschinentechnik
Siemensstraße 17
D-74722 Buchen/Odw.
Germany
Tel.: +49 (0) 6281 / 5208-0
Fax: +49 (0) 6281 / 9150
E-mail: service@weiss-gmbh.de
Internet: http://www.weiss-gmbh.de

All addresses of agents are available on the internet.

12. Disposal and Recycling

12.1 Disposal and Recycling

A indexing table that cannot be used anymore may not be disposed of as a complete unit.

WARNING

The oil in the indexing table has to be drained before the table is disassembled and has to be delivered to an authorised oil collection place for environmentally compatible disposal.

Thereafter, the indexing table has to be disassembled. The individual parts have to be recycled according to their type. Materials that cannot be recycled have to be disposed of according to their type!

Information concerning disposal and collection point is available from your local authorities.

The relevant national and regional laws and guidelines have to be adhered to during the disposal process.

13. Appendix

EC – Manufacturer Declaration according to the EC Machine Guideline (98/37/EC), Appendix II B

The manufacturer:	**WEISS GmbH** **Sondermaschinentechnik** **Siemensstraße 17** **D-74722 Buchen** **Germany**
declares hereby that the machine described below:	**Indexing tables NCxxxT with associated B&R control system**

is not a useable machine according to the EC Machine Guideline and does therefore not comply in full with the requirements of this guideline!

The initial operation of this system is prohibited until the conformity with the EC Machine Guideline of the total machine in which this system is installed has been established!

EG Guidelines used:

0	98 / 37 / EC	0	Machine Guideline
1	73 / 23 / EEC	1	Low-voltage Guideline

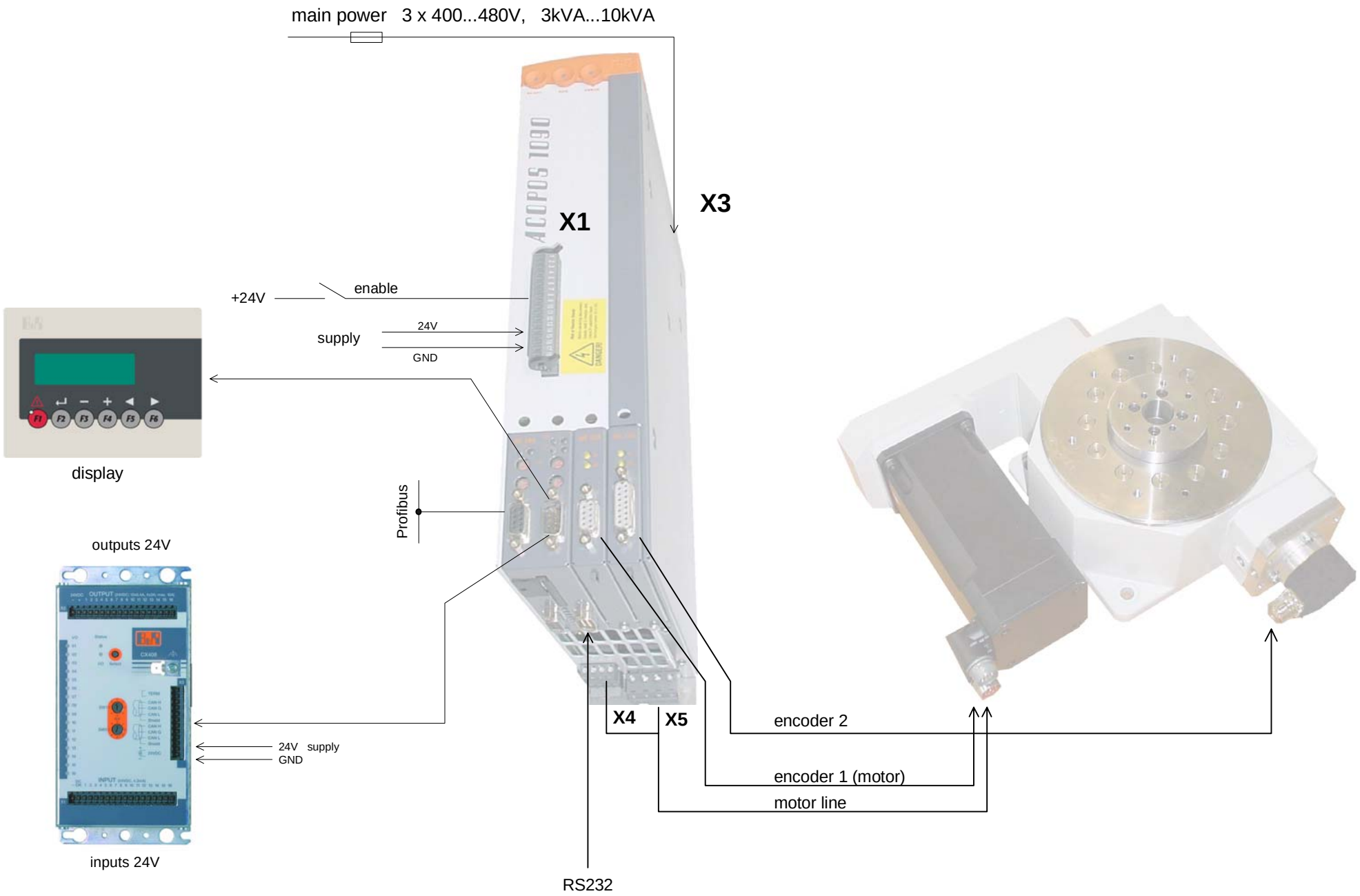
Harmonised standards used:

2	DIN EN 60034	2	Rotating electrical machines
3	DIN EN 60204	3	Safety of machines, electrical equipment
4	DIN VDE 0470 – 1	4	Protection types through casings
5	DIN EN 414	5	Safety of machines, possible hazards
6	DIN EN 1050	6	Safety of machines, reasons for hazards

Major design changes that affect the technical data provided in this product description and the appropriate usage of the product make this conformity declaration invalid!

Buchen, 07 of August 2004

Uwe Weiss, CEO



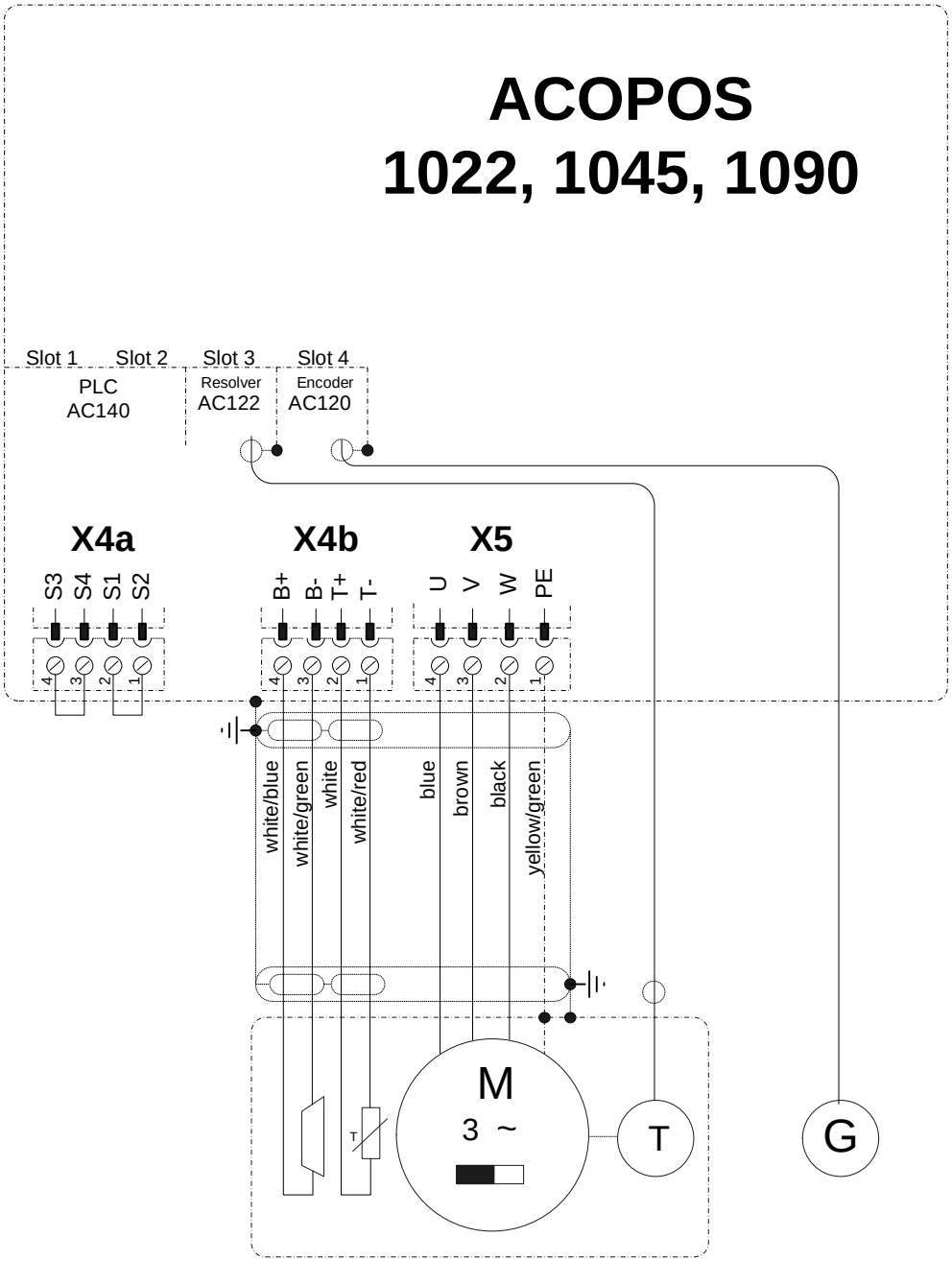
Vers.	Name	Date
V 1.0	Erbacher M.	07.09.04
V 1.1	Erbacher M.	26.04.05

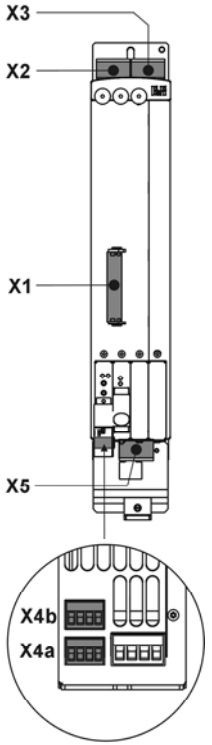
Indexer NCxxxTBx

WEISS GmbH
Sondermaschinentechnik
Siemensstraße 17
74722 Buchen/Odw.

overview
block diagram

ACOPOS
1022, 1045, 1090





Vers.	Name	Date
V 1.0	Erbacher M.	07.09.04
V 1.1	Erbacher M.	26.04.05

Indexer NCxxxTBx

WEISS GmbH
Sondermaschinentechnik
Siemensstraße 17
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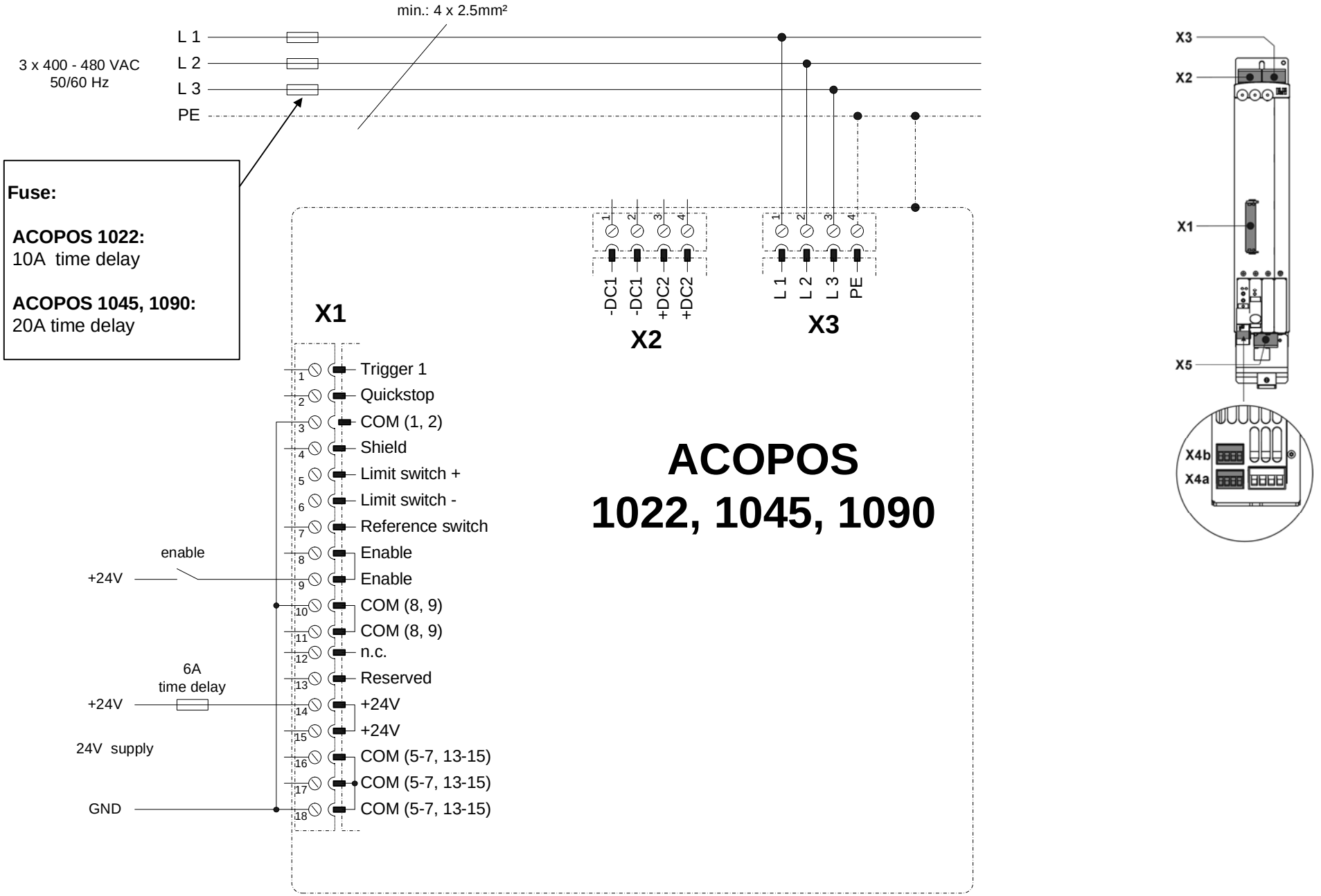
motor connection

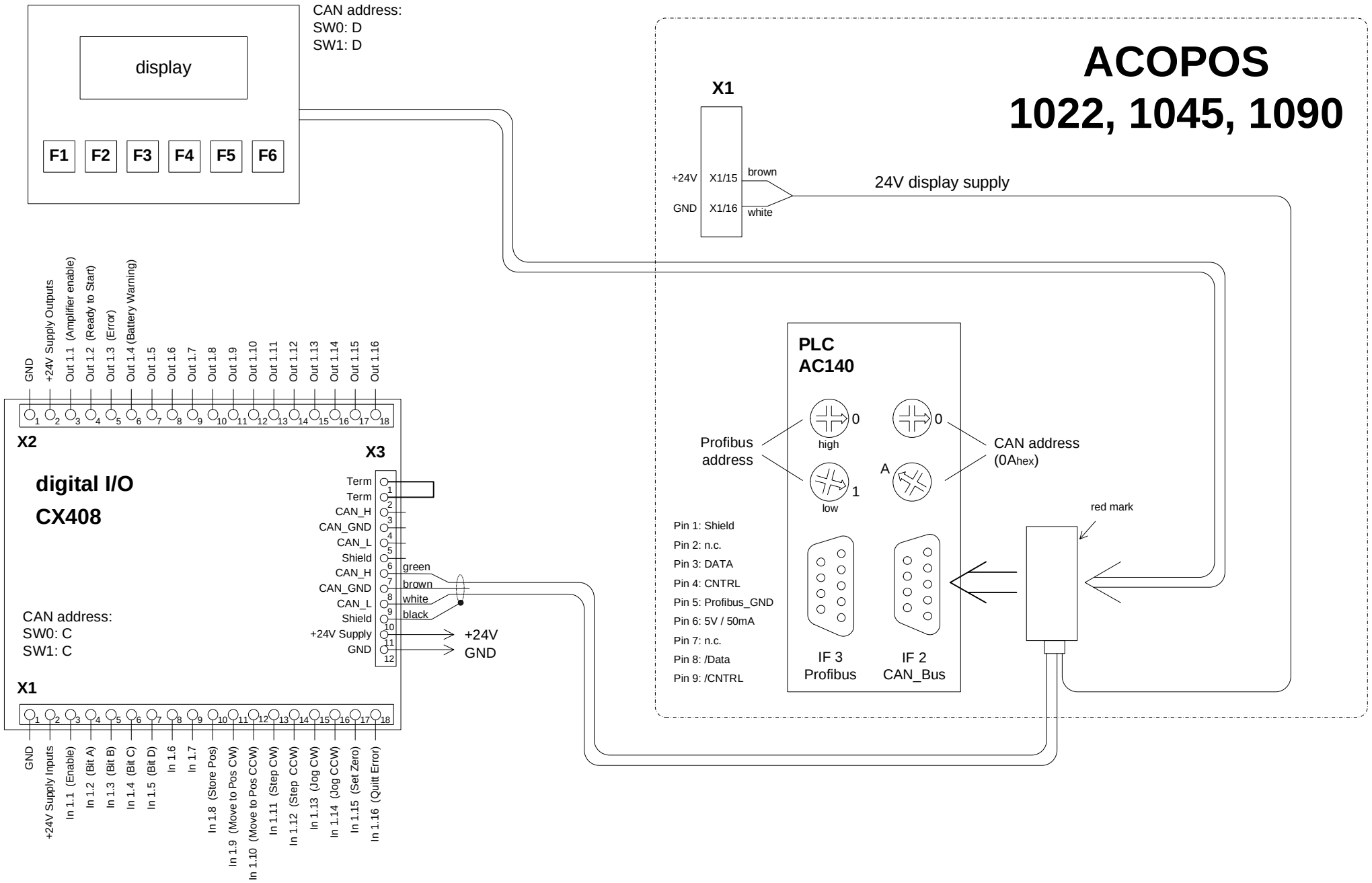


Vers.	Name	Date
V 1.0	Erbacher M.	07.09.04
V 1.1	Erbacher M.	26.04.05

Indexer NCxxxTBx

WEISS GmbH
Sondermaschinentechnik
Siemensstraße 17
74722 Buchen/Odw.

- main power
- X1 plug



Vers.	Name	Date
V 1.0	Erbacher M.	07.09.04
V 1.1	Erbacher M.	26.04.05

Indexer NCxxxTBx

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- PLC
- digital I/O
- display

WEISS worldwide

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